# The Dental Digest.

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## Original Contributions.

### A CONTRIBUTION TO THE ETIOLOGY OF MALOCCLUSION OF THE TEETH.

BY B. E. LISCHER, D. M. D., ST. LOUIS, MO. READ BEFORE THE MISSOURI STATE DENTAL ASSOCIATION, AT SPRINGFIELD, JUNE, 1906.

Among all questions, theoretical or practical, that command the attention of orthodontists, none can surpass in importance those grouped under the term etiology. For if it is the mission of orthodontia to *prevent* irregularities as well as correct them, then it is obvious that our best remedies are those which act etiologically.

The present bitter disagreement in the orthodontic circle can be traced to differences of opinion regarding the methods to be adopted and the ends to be sought in the treatment of cases. But while some continue to disagree on those fundamental conceptions, the discussion of which has precipitated this critical debate, it is quite otherwise with our theories concerning the causes of malocclusion.

In reviewing the literature pertaining to causation, one is impressed with the quite general agreement that obtains among most writers as regards a classification of all factors usually accepted under this heading. Nearly all agree to such a division of them as is implied by the following two classes, hereditary and acquired. Some dental writers find little difficulty in formulating definitions for these two terms, and this has, no doubt, been the cause of some confusion. Moreover, the equal potency of these divisions is seriously doubted; there is a tendency for writers to lean toward one side or the other. Of course, in a general way it may be said that the law of hereditary transmission is tacitly admitted even by writers who lean strongly toward "local" or "acquired" causes and who give

evidence of doubting the transmission of nontypical peculiarities.

It is claimed by others that "variation is coextensive with heredity," and it would be highly interesting at this time to weigh carefully the arguments advanced in support of the "tendency to variation" as against the "tendency to repetition," but space forbids our doing so.

It is impossible in this brief discussion to cover the entire subject of causation. But before proceeding to a consideration of *acquired* causes—for it is under this division that the present contribution is to be made—it is deemed desirable to review hurriedly several

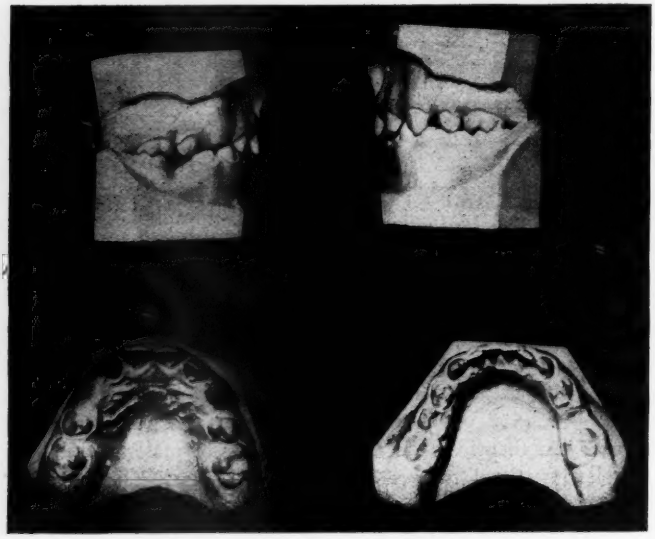

Fig. 1.

fundamental principles. We ask, then, what is the meaning of *inherited,* of *congenital,* of *predisposition;* and what characteristics, if any, shall we say are *acquired?*

I.

Herbert Spencer, in his chapter on heredity, has well said: "This truth has been rendered so familiar by daily illustration as almost to have lost its significance." Continuing, he says: "The general

truth that organisms of a given type uniformly descend from organisms of the same type is so well established by infinite illustration as to have assumed the character of an axiom; [but] it is not universally admitted that nontypical peculiarities are inherited."

INHERITED.—All peculiarities or characteristics that are imparted to an individual through the germinal cells of his parent are spoken of as inherited. "Only through the germ-cells does a descendant inherit from an ancestor."

CONGENITAL. All inherited peculiarities may be said to be congenital, whether recognizable at birth or not; but not all congenital phenomena are inherited. As, for example, we may speak of certain fetal deformities as congenital, but no one would call them inherited if abnormal uterine pressure was known to have been their cause.

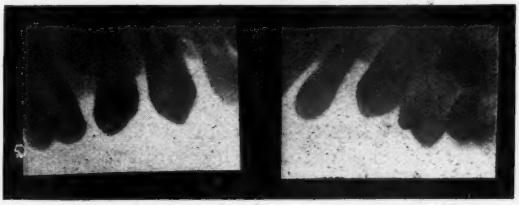

Fig. 2.

ACQUIRED.—Any peculiarity or characteristic that is imparted after conception has taken place is spoken of as acquired, as an acquisition. If before birth, it is termed an *intrauterine* acquisition; after birth, as an *extrauterine* acquisition.

PREDISPOSITION.—Upon the subject of predisposition, Prof. J. Orth, of Berlin, has this to say: "Every incapacity of the body to resist external causes of disease, every peculiarity of the constitution which renders the latter unable in the struggle of the body with the causes of disease to maintain the normal course of the vital phenomena, every such peculiarity of the constitution may be designated as a tendency, as a predisposition, to disease. All these predispositions to disease must be congenital and inherited, for they are a result of the phylogenetic development; they have their origin in the general characteristics inherent in the germ-cells. This conception of what constitutes predisposition to disease does not contain anything mystical; it is not beyond the domain of science and is just as capable

of scientific treatment as any other pathogenetic question, though we must admit that our knowledge of the predispositions to disease does not go much beyond a few generalities."

II.

This short survey of a rather wide domain brings us to the second division of our subject—to a consideration of acquired causes. Many recent writers regard them as far more important than the

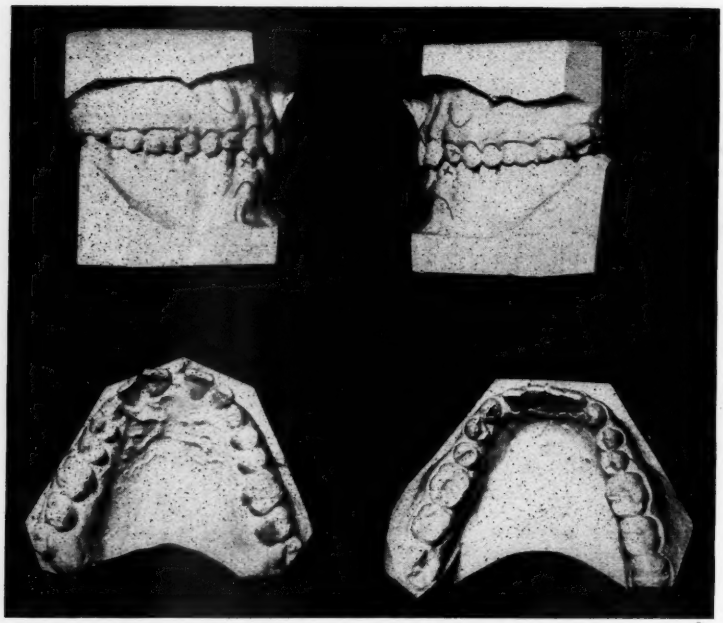

Fig. 3.

inherited causes, and it is no doubt true that they are, to a considerable degree, under the operator's control. The more completely we understand them the more intelligent will be our services. But here again certain erroneous ideas prevail, upon which more light ought to be thrown, else how could such a latent hereditary factor as supernumerary teeth be classified as an acquired cause? It is quite true that supernumerary teeth are sometimes spoken of as a "local"

cause, but local is a poor word, and so far as effects go, all are *local*. We have no evidence that will enable us to set up the thesis that they are an intrauterine acquisition and so we must, for purely logical reasons, throw them into the hereditary group, even though our text-books do otherwise.

One need not proceed very far in a consideration of acquired causes when the relation between deciduous teeth and their permanent successors becomes an interesting study. The necessity of avoiding their early loss, as evinced by the disastrous results which usually follow, and their mischievous influence upon erupting perma-

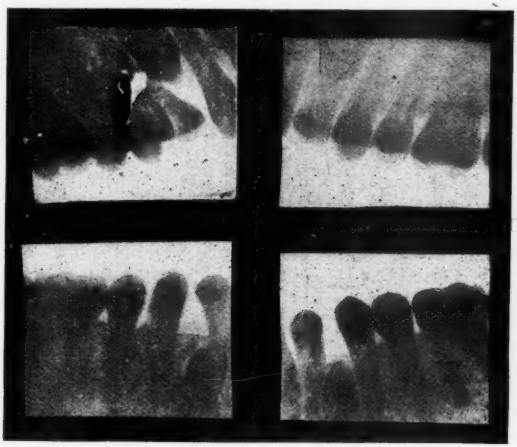

Fig. 4.

nent teeth should they persist long after the need which occasioned them has ceased, are two deductions that all observers accept.

The loss of permanent teeth during adolescence, particularly the first molars, is another cause now generally accepted. The reckless extraction of prominent cuspids is still persisted in by operators who do not heed the consequences.

Such a pernicious habit as the continual sucking of a thumb or of lip or tongue during waking hours is another cause of irregularity, though it is usually corrected before its influence is carried to the permanent teeth. Some authorities have recommended correction of malposition resulting from this cause in the temporary set. Any

further treatment than the removal of the cause does seem to be a case of idealism run mad, for all observation emphasizes, over and over again, that normal alignment of deciduous teeth does not insure the same in the permanent set.

An abnormal development of the frenum labium is occasionally a cause of malalignment in the permanent set. At first it is limited to a mere separation of centrals, and early treatment is therefore

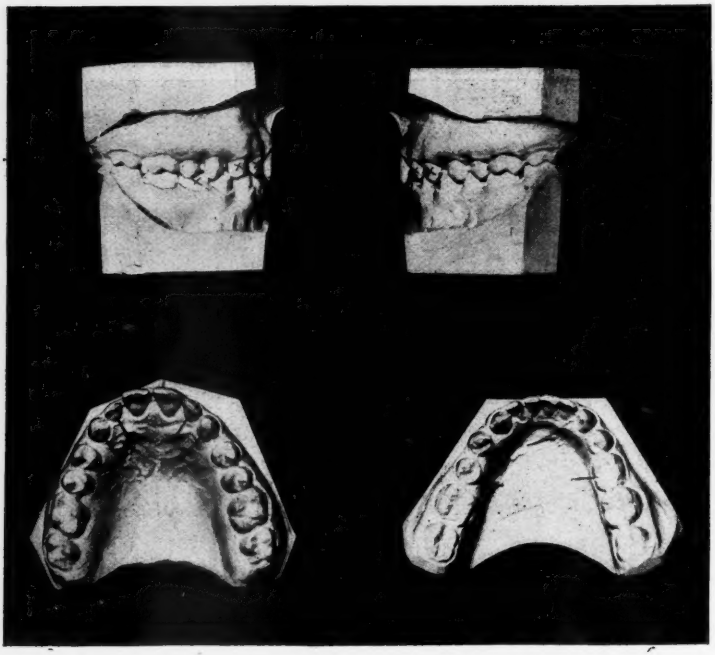

Fig. 5.

always indicated. Should this demand be ignored, it very often leads to more complicated conditions.

During recent years the intimate relation between rhinology and orthodontia has been more fully recognized, and as a consequence such acquired factors as nasal occlusion and septal deviation have been more freely discussed. Indeed, so rapid has been our progress along these lines, and so wide is the field, that an entire paper might

well be devoted to this subject, and so a mere mentioning must here suffice.

Figures 5, 6 and 7 show the models and radiographs of a case of deficiency in the number of teeth. They are from a lad of sixteen

Fig. 6.

years, and show the upper deciduous laterals and cuspids (right and left) and the right lower second deciduous molar, all in position. The radiographs show very clearly that there are no permanent teeth in process of development.

III.

And, now, finally, we come to our own contribution, which must be classified under the acquired group, and which we have called Hyperplastic Formation of Connective Tissue.

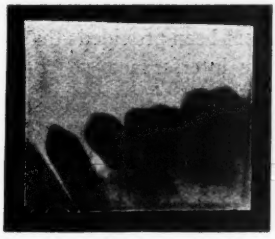

Fig. 7.

Mr. H. L., aged 16, applied for treatment, and an examination of the mouth revealed an attachment of the muscular tissues of the cheek with the lingual gingiva at the site of the lower first bicuspid. The unerupted tooth could plainly be felt, and after the overlying tissue was cocainized and removed, eruption speedily fol-

lowed. A careful inquiry into the history of the case revealed the following: About the eighth year the patient had a chronic abscess resulting from infection of the pulp of the lower left first deciduous molar, which had been exposed through caries. This finally discharged into a sinus, which relieved him, so that nothing further was done. It is evident that caries finally destroyed all of the remaining tooth tissue that was not absorbed, and the membranous surfaces of surrounding tissues being inflamed, together with a ces-

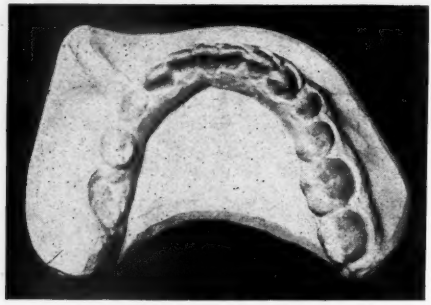

Fig. 8.

sation of suppuration, coalescence took place, resulting in this fibrous adhesion.

Tardy eruption of a premolar may not be regarded as very serious, but in view of the fact that its retention might have been prevented had proper treatment been provided; that it would never have erupted but for operative interference, so completely was it covered by this attachment, and because no similar case has ever been reported, it was considered sufficiently important to bring it to your attention.

Discussion. *Dr. C. D. Lukens*, St. Louis: This subject is the key-note of orthodontia. Most of the failures in this work are due to the fact that operators do not appreciate the etiology of malocclusion. Almost any one can move teeth and place them in a more satisfactory position, but to make a permanent result you must appreciate the etiological factors in the case. As to the various points brought out in the paper, one of them was the idea of trying to correct irregularities in the deciduous teeth. You will find writers on this subject recommending such a procedure. As Dr. Lischer has

expressed it, it is idealism run mad. Irregularities in the deciduous teeth are very rare, and then it is usually an acquired condition. He brought out another important point and illustrated it beautifully in those skulls—jumping the bite. The theory that any change takes place in the articulation of the joint is absurd. You cannot hold the mandible forward long enough to produce any change. There is no change in the glenoid fossa. The change is entirely confined to the shifting of those teeth. The subject of mouth-breathing is not sufficiently appreciated. Men will undertake the correction of these malformations without consideration of the primary cause. As long as that condition still exists, the moment the mechanical appliance is removed the teeth will return to their old positions. As to this idea of harmonizing the arch, it is well known that there is not a systematic development; the upper first bicuspid, for example, may be larger than the other; so this idea of expanding both arches and getting them the same size, in the belief that it will always bring about practical occlusion, is absurd, for it does not and cannot do so.

*Dr. J. H. Kennerly,* St. Louis: I think if the members of the Missouri State Dental Association remember the former experiences of these specialists who have prepared papers for the society that this would be the last paper on this subject before this association. Three years ago in Kansas City I stood over a lantern on one of the warmest nights while Dr. Lukens gave a similar paper, and there was not a single man who discussed that paper that night. It does seem to me that if men expect members of the profession to produce scientific papers before this society they ought at least to think enough about it to ask questions, even if they cannot talk about it. If you gentlemen, who are not as familiar with this work as many of us who have the advantage of clinics of this character, could see the results of such work, you would certainly get on your feet and bear testimony to the good work these men are doing. Most of the cases shown to-night I have seen carried through to their conclusion. I have watched the various steps from day to day and from year to year as they progressed under the hands of the operator, and I bear witness that these patients are normal to-day. It is a sad fact that the members will not even ask a question to encourage the men who do this work. I know of no subject of more vital importance to our profession to-day than orthodontia. While I

don't made a specialty of it, I am sometimes asked to take charge of the clinic of Dr. Lischer. He has daily from fifteen to twenty-five patients, from five or six years of age to twenty or thirty years. I see those little children coming there with all the confidence in the world, though the first time they came they were scared nearly to death. These results are actually accomplished, and that should warrant your serious attention.

*Dr. H. H. Sullivan,* Kansas City: There are some things in connection with this subject that are very interesting. If some of the younger men would take enough interest in it to ask questions they would be better qualified to do this work when they return home. I recall reading an article recently on wire ligatures fastened to the arch, giving the method of applying them to get the desired result. I mentioned this article to several young men, and they all agreed that it was an article of great value. The radiograph shown is one of the things that is of absolute advantage to each and every one of us attempting anything of that kind. I have a few radiographs made for that purpose. One was of a young lady who, on the advice of two dentists, asked that two temporary cuspids be removed and replaced by bridges. The radiograph showed the undeveloped cuspids. These later developed. Another case was a little girl who came to me with the temporary teeth in position, but they were very loose and I removed them. There was a history of tuberculosis on her mother's side. After two or three years her father brought her in and said: "Those teeth have not come back." The radiograph showed that the two superior laterals were entirely absent, the two central lower incisors in the same condition—no trace of them. This patient is now a young lady. There are two very large centrals, no laterals, and the frenum is very wide. There is only one bicuspid on each side below. There are no superior laterals, and on one side one bicuspid, on the other two. Sometimes even a hint may help a man in trouble, and so I would like to have some advice about this case. I have another case in which the right superior lateral is distal to the line of occlusion. I used an expansion arch and brought the lateral into position. The lateral is worn away by occlusion; it is too short. Now what should be done there?

If these men will come before us from year to year with these splendid papers, and will take us as though we were mere boys and girls, we will be better off, and they can throw in some of the big

cases later on. If they will take some molar bands and expansion arches and go to work they will accomplish something.

*Dr. J. D. Patterson,* Kansas City: You will remember that in later years some prominent writers have told us that the influence of heredity was almost *nil* in the production of malocclusions. They have said it was scarcely a factor at all. I have always opposed that teaching and have spoken against it, and I am very glad to hear Dr. Lischer to-night in such a scientific paper give to heredity its proper place. It has, if not the greatest influence, at least as great an influence as any other factor in the production of malocclusions.

*Dr. Crozier:* Like Dr. Sullivan, I have these patients occasionally, and there is no class of patients more gratifying, and there is no class of work we do that is more beautiful and enticing than work on irregularities. We should be very grateful to the men who work out these problems for us. If these men will give us instructions from year to year it will help us greatly. The difficulty now is that this paper is so far ahead of us that it is hard to ask intelligent questions on the subject.

*Dr. H. S. Lowry,* Kansas City: I have listened to many papers on orthodontia, have appreciated them all, have recognized the enormous study required in their preparation and have learned much from the papers I have listened to on the subject, but I have never in my life heard an orthodontist take a particular case and explain to the association how that particular irregularity could be corrected. I think they take us into the subject a little too deeply. We want particular cases. We don't learn very much from generalizations. We learn from a concentration of the attention on special things. None of the orthodontists I have ever heard have taken it up in that way. I don't blame them; that is their specialty. If they have any secrets in correcting these irregularities it is all right, but I don't think that is the question. Possibly they think it is out of the question to try to educate the rank and file. They tell us it can be done, that it should be done, and prove to us that they can do it. I have done some work in this line and have done it successfully, but if I should take it up and write a paper on the subject I would take a particular case and carry it straight through and tell what caused the condition and how to remedy it. We must take into consideration that we dentists in the city have the advantage over the

rural dentist. If the rural dentist has such a case he must correct the difficulty himself, and for this reason the orthodontists should tell them just how to do it.

*Dr. Lischer* (closing discussion): I feel very grateful for the kind remarks, and in reply only want to say a few words. Our motives are not of the kind imputed to us by Dr. Lowry. We do not want to keep any secrets. If there is anything I possess in the way of knowledge I want to give it freely. There are no secrets. You are welcome to any of it. The reason these points are not brought out is that we do not consider them of sufficient importance. Probably we do not recognize your needs. I remember the first paper on orthodontia ever read by me. I illustrated every particular phase of the treatment; but even though you do that it is of doubtful value to the general practitioner. You probably know what an immense amount of labor it is to prepare such a set of illustrations, with four or five views on every slide, and to illustrate the technical and mechanical details is still more difficult. But if that is what the society wants it can certainly be brought here. If you feel that that is important you will be supplied. Like Dr. Patterson, I believe we have ignored the question of hereditary transmission. I think most of us do not read enough outside of our professional literature. We ignore the great truths biology has taught us. Heredity *is* an important factor, and in future much work will be done along this line. We have been over enthusiastic on this question of acquired causes and have forgotten all about the hereditary causes. I could not give a satisfactory reply to Dr. Sullivan's questions unless I had a model, and even then many other facts would have to be considered. I think the correction of many cases of malocclusion have been attempted, even by specialists, that should not have been attempted. In many cases, in trying to bring about an alignment, we may promote an atrophic condition of the alveolar plates. The question as regards the density of the alveolar process after treatment is one of the unsolved riddles, and until we do know more about it how can we give a favorable prognosis in all cases? I think we are now on the very crest of the orthodontic wave, and though it may recede, we have still made a considerable advance. As to Dr. Sullivan's last case, it is well to remember that there are some cases of malocclusion where crown and bridge work will do more for you than orthodontia; and in all these cases where you are in

doubt, an accurate model made before treatment will aid you. You can study this on your desk and you can see whether the lateral is long enough when brought into alignment. I want to thank Dr. Lukens especially for his services, and would only add that this has been a labor of love and has been given you freely.

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## THE DETRIMENTAL PHYSICAL PROPERTIES OF EXPANSION AND COMPRESSION OF PLASTER OF PARIS.

BY J. H. PROTHERO, D. D. S., CHICAGO, ILL. READ BEFORE THE MICHIGAN STATE DENTAL ASSOCIATION, AT DETROIT, JULY 10, 1906.

For some time past I have been interested in the peculiar physical properties of plaster of Paris, particularly those of expansion and compression.

To study this material with any degree of accuracy, it was necessary to construct suitable recording instruments for noting the changes which ordinarily occur, as well as those brought about by manipulation procedures. The results of many experiments conducted with the appliances mentioned have been given to the profession from time to time in various papers and journal articles. It is not possible at this time to present anything new in this field, but an effort will be made to point out the results of expansion, warpage, and compression on denture adaptation.

### EXPANSION.

When dental plaster, of a good quality, and water are mixed in proper proportions, recrystallization or setting usually begins in from two to six minutes. At the initial stage of the setting process a very slight amount of contraction is noticeable; then follows a short period of inertia lasting a minute or two, after which expansion sets in.

The expansion begins slowly, increases rapidly until in about four or five minutes the maximum rate of movement is reached, when it gradually decreases and is apparently over in about twenty minutes from the time of making the mix. As a matter of fact, expansion to a limited extent continues for twenty-four hours or even

a longer time with no perceptible contraction following. During the setting process a rise of about ten degrees in temperature in the mass is noticeable.

Considerable difference of opinion exists as to the percentage of expansion which ordinarily occurs. Dr. Spence states that the average is about one percent, while in the experiments I conducted the average was about one-fourth of one percent. Without doubt the difference noted can be partially accounted for by the difference in manipulation.

In the experiments alluded to, an effort was made to subject the material to the same treatment it ordinarily receives in the dental laboratory. No attempt was made to induce abnormal movement which could easily have been brought about by long-continued and rapid stirring, and therefore I am of the opinion that my own estimate is more nearly correct. The fact remains, however, that all plasters expand whether much or little, and that this movement even under the most favorable conditions, results in enlarged and frequently warped molds.

## WARPAGE.

Warpage of plaster models is induced in two ways: as the result of expansion, and as the result of compression in flask closure.

Let us for a moment consider the result of expansion of a plaster upper impression in a metallic tray with fixed sides. The sides of the tray, being immovable, act as points of resistance and prevent lateral expansion. The palatine portion being arched, is unfavorable for holding the impression closely to this area, and consequently as expansion occurs, the impression is lifted away from the tray by the expansive force.

This fact is denied by some, but can easily be demonstrated by trimming the overhanging plaster away from the distal margin of the tray when the space between the impression and the tray will be brought into view. A model secured from such an impression would have a deeper palatine arch than the mouth it represents, while if the tray and impression were not quickly removed from such a model, the latter would also warp in the same location and the error thus be practically doubled. A denture molded over such a model would touch the central palatine portion of the mouth before becoming

firmly seated on the alveolar border, and therefore would tip under the slightest stress.

A few suggestions relative to obviating this trouble are here offered.

Add a little sulphate of potassium to the water before introducing the plaster to accelerate the setting and also to reduce the tendency to expand. Stir the mass very little or just enough to insure a uniform mix.

Trim the impression immediately upon removal from the mouth, apply the separating medium and introduce the plaster for the model. When the latter has set sufficiently to permit, remove the tray and impression. This will prevent warpage to a great extent, but will not obviate expansion. The expansion is compensated for by scraping the periphery of the model along the line where the denture margin will rest. These steps if properly carried out will result in good denture adaptation, if in the subsequent step of closing the packed rubber case the model is not warped or compressed by pressure.

COMPRESSIBILITY.

Plaster is capable of being condensed if sufficient pressure is brought to bear upon it. Condensation occurs in line of direction of the applied force, and nowhere else. The molecules lying just outside of the line of direction of the force are not disturbed by the molecules subjected to pressure since there is no tendency to slide or creep from under the load and therefore no bulging of adjacent surfaces occurs.

A model imbedded in a flask that contains an excessive amount of vulcanized rubber will be compressed and warped out of shape under undue pressure. The force capable of being applied by flask closing devices is enormous. Take for instance a flask wrench four inches in length and a flask bolt having twenty threads to the inch. Apply a power of twenty-five pounds on the wrench handle and the result is a pressure of over two tons on the contents of the flask.

The rule for finding this is as follows: Power is to weight as the distance between two contiguous threads is to the circumference of the circle described by the wrench at the point of application of force. Usually one-third is deducted for friction.

I am convinced that much more force is usually applied in flask

closing than plaster models are capable of withstanding without changing form or distorting, and this fact is responsible for many of the failures which occur.

The object in carrying out the steps that I have outlined is to preserve the integrity of the plaster model. In other words, when plaster models are subject to moisture they are rendered softer and under ordinary pressure will compress more readily than when dry, therefore, if it is possible for you to carry out the steps of packing and closing the flask without moistening the plaster, you will get better results.

Another point is to vulcanize in steam vapor. A cubic inch of water makes a cubic foot of steam, and the plan that I have followed is to place in the bottom of the vulcanizer a small block of zinc and place the flask on that and place enough water in the vulcanizer to steam the interior, thus placing the flask entirely above the water. The object in using the zinc is to prevent the flask becoming blackened with the iron sulphid which so readily occurs. The reaction which occurs in the vulcanizing takes place with the zinc instead of with the iron or brass flask.

By strengthening the periphery of the model we get better results than we would were it done by the usual methods. There is not one vulcanized case in five thousand tha. is distorted where perfect adaptation is secured. A force of from one-half to twenty pounds will displace any denture that most of us have ever seen.

Discussion.—*Dr. N. S. Hoff,* Ann Arbor: The statements made in this paper are so obviously conclusive that it leaves one no ground for criticism, and I have no disposition to criticise at any rate. In regard to this matter of expansion of plaster impressions, due to the setting of the plaster, I have a few words. Take a plaster impression in a smooth polished tray and leave it several hours over night, in a warm room, and you will find it is very easy to lift it out of the tray. I think the essayist is perfectly justified in saying there is a change in the form of the impression; I used to think the model had contracted, but now I can see from the experiment the essayist has made that it is probably an expansion. I am hardly convinced that this expansion is of sufficient amount to badly distort the impression. It would appear to me that the impression should expand in all directions so that the amount of change would be more or less equalized. It never has occurred to me before that faulty adaptation

of vulcanized dentures was due to the fact that there was a change in the form of the plaster impression itself. I have always attributed this to faulty manipulation in the vulcanizing process; to the methods used in packing and vulcanizing the rubber, more than to the change of form in the plaster impression or model upon which it was made. My favorite method of taking impressions is with plaster, unless there are inequalities in the density of the tissues requiring condensation, when I want a beeswax or modeling compound impression. Usually I take a plaster impression; preferably because it gives me not only the correct form of the mouth but the absolute detail, more than you can get with modeling compound or any other impression material. I usually pour my impression very soon after it is taken and do not use the separating medium as many do, simply soaking the impression in water before pouring.

Place the impression in water immediately and allow it to take up all the water it will, until there is no appearance of any bubbles coming up through the water. I mix my plaster by first dissolving the potash in the water, then sift the plaster in until the water is thoroughly full of plaster; let it stand a moment and then pour off the free water on top and stir it just a little, enough to mix the plaster and pour it at once. I get a hard model in this way that does not break during manipulation, and I feel that it does not condense under the pressure that is necessary in packing and vulcanizing. Many times we blunder by having the model too thin. We cut the model down, particularly where there is a high arch, until there is not enough substance to it to sustain the pressure brought to bear.

In the preparation of the models themselves for the vulcanizing process we often make the mistake of saturating them with water after we have secured the model, or in boiling out the wax. We ought not to do this. A plaster model that is very hard and dense if simply dropped into water for thirty seconds and taken out can be whittled very easily. If you have a very thin model it will soak up enough water in a short time to destroy its integrity sufficiently to cause it to break under the pressure put upon it in closing the flask.

In the matter of flasking these pieces, I have not yet found a flask that is at all to my notion. All of our flasks are not deep enough. You cannot put into any of the brass flasks on the market an ordinary model with teeth on it and have more than perhaps half an inch of

plaster over the palate where the great amount of pressure is usually brought to bear. Sometimes models here are cut down to possibly one-eighth of an inch, so that you can hold them up to the light and almost see through them. You cannot expect a model of that kind to stand the enormous pressure of two tons that Dr. Prothero says is frequently put upon such a model, without its fracturing. The support that you get from the investing plaster is not sufficient to support such a thin model. If the model could be made thick enough it would withstand the pressure without giving way. The flasks should be at least three-fourths of an inch deeper than they are.

In connection with packing the flask another thing might be mentioned. We usually close them in boiling water and put in so much rubber that we cannot possibly get the flask together, and then we boil for ten or twenty minutes to get the vulcanite to flow away in order to get the flask together. This boiling of the plaster must disintegrate it and destroy its integrity.

In the matter of cutting gateways in the investment we often make a mistake. The ordinary method of simply cutting grooves from the matrix to the rim of the flask is a mistake. A better plan is the method advocated by Dr. Snow, which is to cut a groove in the plaster investment all the way around the flask at its outer edge, cutting it deep toward the flask and beveling it to the edge of the matrix so that as the flask goes together there is plenty of space for all the excess of vulcanite to flow out, but when the flask is entirely closed the two edges of the investment come in contact and no more of the vulcanite can escape. During the process of heating the vulcanite swells and expands until you get to the vulcanizing point where it begins to carbonize and harden, and then it begins to shrink upon itself. If you have gateways that carry off the excess of vulcanite it never gets any pressure, because it flows away and never gets back into the matrix, and as the vulcanite in the mold shrinks, it draws away from the model or from the teeth, leaving spaces about the teeth.

In this form of investment we should use the Donham spring clamp to hold the flasks together, as the pressure, of course, must be enormous if we use the ordinary bolts for holding the flask together. As the vulcanite swells in the process of heating these springs allow the flask to open, and as it hardens it comes back together. In this way we get the vulcanite hardened in the most per-

fect manner, and avoid its shrinking away from the teeth. We should vulcanize all rubber under spring pressure and get rid of the enormous pressure that we would otherwise subject the plaster mold to if we had only the bolts and screws. We do not pack vulcanite with the care we should. We do not go to the trouble of warming the flask even, and we cut great strips of vulcanite and put them in the flask cold, and try to screw them together in boiling water and expect to get good results. It is remarkable that we get as good results as we do from this slovenly method. The fact that we get any desirable results from the process is a great compliment to the vulcanite, demonstrating that it is an exceedingly tractable material and can withstand a great amount of abuse without resenting it.

If we would take more pains we would get more sanitary plates, and I have no doubt would be surprised that our vulcanite plates were found to fit much better than when we did not take into account these methods. A large number of dentists make vulcanite plates; probably many more of them than of any other kind. We ought to make them in the best possible manner or not at all; because they can be made so easily the work is often done by the office boy or some equally inexperienced or unintelligent person. It is unprofessional for us not to study the details of this work and do it as it should be done.

*Dr. Land,* Detroit: If we cannot determine the different angles of the model surfaces, we cannot arrive at any conclusion as to which way the shrinkage or expansion of the model will take. If a high model is packed in the center and we don't provide for the relief of the excessive pressure of the vulcanite, it is going to push the center out of place when we pack it. If every model was perfectly flat or horizontal it would not matter if there were twenty tons pressure, it would be exactly the same shape, so we must study the angles. If every mouth was two inches square and perfectly flat, where would our changes come? Where a model is at different angles and we pack on those angles and do not take into consideration the direction of the flow according to the angles we will never arrive at any satisfactory conclusion until that influence is accounted for. I never find it necessary to cut a gate in the plaster mold, because I put the mass of vulcanite on the alveolar ridge and let the center be the relief. There is where our trouble occurs. If we make all our pressure on the alveolar arch it will not do any particular harm

because we will get relief at the center. If we put no rubber in the center and let the force come on the alveolar ridge, we will have no force on the center. If every arch we made simply described a horizontal plane, expansion would amount to nothing. If it shrank only one percent it would amount to nothing in an artificial set of teeth, because one percent will always conform in any mouth to any angle. It would conform if there was a change of a quarter of an inch.

*Dr. C. H. Worboys,* Albion: The expansion of plaster is readily shown to any one who works in the plaster if he makes the model flat. I will give you a little experience I have had. Out of seven plaster impressions taken of five different mouths, dies poured in low fusing metal, five resulted in misfits. Five plaster impressions of the same five mouths, taken as most of us take these plaster models, by zinc dies made from the plaster models, resulted in five fits—that is, the patients could wear them. We all know that zinc shrinks considerably and the shrinkage of the zinc just about made up for the expansion of the plaster.

As to the plaster expanding in the tray—it just occurred to me that perhaps the tray expanded from the heat somewhat; most metals do expand, and it may have a tendency to warp the plaster impression which is not as fully set at that time as it would be later.

Speaking of having deep flasks, I do not take any stock in that at all for a plate with a high arch. If we had a mouth to be fitted with a plate that was very flat we should get a thick body of plaster and that would give us a chance for greater compression than a thin body of plaster.

We cannot compress a quarter or an eighth of an inch of plaster as much as we can a half an inch, so that part I do not think makes any difference.

About the vulcanite coming up tight to the teeth, I think that the large waste gates help to let it away. Some of the best results that I have had in plate work have been where there was no scraping of the models or impressions. Why I succeeded so well in these cases and failed so utterly in others I am not able to say.

*Dr. Prothero:* I am still of the same opinion that I was before that waste gates are valuable where made properly, and Dr. Hoff has outlined the method that I have followed and for which he gave credit to Dr. Snow for having mentioned. I think I got the idea

of carving at the margin, so that when the flask is partly closed you have free scope for excess. I can get just as good adaptation by packing the flask as I have outlined as any one can in any other way. If you cut the gates right and use slow pressure and plenty of dry heat you will get the surplus out and into the waste space without distorting the face of the model a bit. I have had better results than I ever dreamed of having. Instead of vulcanizing work being a bugbear it is a pleasure, because dentures will fit comparatively well when placed in the mouth. I do not think I can possibly get perfect adaptation.

I believe that if we secured perfect adaptation the patient would not be able to wear the plates with any comfort. If the denture pressed all over the mouth with the pressure of fifty to sixty pounds it would be very uncomfortable to wear. Any manipulation which tends to enlarge, reduce or warp a model will interfere with securing perfect adaptation. I do not care whether it is expansion, compression or warpage, no matter how slight, if we can get rid of it we will get better results.

I want to outline a method of taking impressions, which I have followed with a great deal of satisfaction. It is not supposed to be very popular, but I am coming to try it in certain cases. When there are no teeth in the mouth a modeling compound impression can be secured which will give a more accurate representation of the mouth than plaster of Paris will give. Take the impression in the ordinary way, using good modeling compound. Chill it all through. If you use cold water to chill it, wipe off the water and hold it over a small alcohol flame or Bunsen burner and warm the surface from one-twenty-fourth to one-sixteenth of an inch in depth until the surface is quite plastic and the body of the impression is stiff. Introduce it in the mouth and press it firmly to place and you will find in many cases it will be almost impossible to remove the impression the second time. The best qualities of modeling compound will not expand or contract to any appreciable extent. Remember, now, I am not advocating the use of compound for partial cases or where there are heavy undercuts in the ridge, but in cases where the impression can be taken away readily.

A word in regard to the use of sulphate of potassium. In the experiments conducted I found that about five-tenths of a gram of sulphate of potassium in forty c.c. of water would require about fifty-

five dr. plaster of Paris to make and mix without throwing out any water and the mass would be of medium consistency suitable for taking impression, and then if it was stirred enough to mix the water and plaster a minimum amount of expansion would result.

I have a machine for measuring the expansion which reads to one-ten-thousandth of an inch, which is as accurate as any machine; it is not a complicated machine, either. When plaster of Paris mixed in the manner I have just described is placed in that machine it shows only from one to fifteen ten-thousandths of an inch expansion, while if stirred for half a minute without the addition of sulphate of potassium it will show from 150 to 200 ten-thousandths. That will reduce it to the minimum so that we will have little difficulty from the expansion which may occur, while if we follow the ordinary method of stirring we get grave results, the same being detrimental to adaptation. Sulphate of potassium should not be used in plaster that is used for models for the reason that steam and water attack a model containing sulphate of potassium much more rapidly than if the plaster is mixed without potassium, therefore we are trying to keep the plaster model hard as long as possible until the rubber has begun to carbonize.

A friend of mine told me one day what kind of a press he used and the pressure he put on the end of the handle, and I sat down and figured it out and found that he was using seven tons for closing each flask. You would be surprised at the enormous pressure we ordinarily use with the ordinary four-inch flask wrench. The double end handle flask wrench will exert a pressure of two to three tons, and the Donham spring, I believe, if handled properly, will give better results than the closing of flask under heavy pressure, but will not give any better results than can be secured by using a moderate amount of pressure when the models are dry. Nearly all of you, I believe, have put sufficient pressure on models in closing to fracture the models.

In regard to adaptation in general, I will say that we owe it to the vulcanite largely, but more largely to nature for having covered the palatine portion of the mouth with a tough mucous membrane, which, as Dr. Land suggests, will in time be drawn down into the heart-shaped suction chambers that we put into vulcanite dentures. If we can secure a perfect impression of the mouth and mold our plate on its model without destroying it, we are going to get a more

perfect adaptation to the tissues than if we depend on a distorted model.

The question was asked whether lime water has any effect on controlling expansion. It has not one particle of effect on it. I have made tests and found out that lime water has no effect whatever on controlling expansion.

*Dr. P. F. Hines:* I was very glad that the doctor brought up the matter of compression. I have read a series of articles in the Items of Interest of '94. I thought them very interesting, and have been endeavoring to put their conclusions into practice, especially in the matter of packing and using dry heat in accordance with the ideas our essayist has suggested. I believe in packing dry, as the results are better, and I think by so doing we certainly get rid of that matter of compression in the deep arches, the alveolar ridge being so much more plastic than it is in the palatine surface that it gives more chance for compression. Over the palatine surface there is, we will say, three-fourths inch of plaster when invested in the flask and the alveolar ridge is from one-fourth to three-fourths inch thick. There will be, therefore, greater compression along the line of the alveolar ridge than on the palatine surface, consequently the vulcanized plate will not fit up to the palatine surface.

*Dr. Land:* When I make a set of teeth I invariably cover the cast with tin-foil and make it perfectly smooth like a mirror. Then I pack the rubber not in excess on the alveolar ridge, as it is important you should know when there is enough rubber there. Then I lay on the rubber a piece of the starched cloth that comes on the sheets of rubber so as to be able to separate the flask for examination. In place of bringing the flask down with the ordinary force, where there is not enough rubber put into the flask to fill it, I put in a slight excess and close the flask in boiling water, allowing the excess to escape to the center of the mold.

Separate the flask and you will find that in place of forcing the rubber to the outside you have closed the outside and have used the center for the escape and you will find that it is filled with no excessive pressure in the center. No denture is injured unless you make excessive pressure on the center. If you do make pressure on the outside it does no harm unless it should shrink a little.

A flat mouth is not nearly so easily injured as a high arch, because if you fill the center with rubber you are going to expand it

both ways in the center. There is absolutely no guess work about it at all. I always know what I am getting, for when the denture is vulcanized it comes out as bright as a mirror.

*Dr Prothero:* Dr. Land's method is a valuable one, but I can get just as good results by having the case carved, if necessary, not putting in any excess at all before the flask is closed. I can get just as good results as he does by forcing the vulcanite to the center. It is a question of care. You soften in boiling water, but put a dry plaster cast in water and let it lay there thirty seconds and you can cut it very easily where you could not cut it before.

*A Visitor:* I would like to say that during the last few weeks I have seen a full upper and lower made on the lines that Dr. Prothero has given us this evening, and the results were most satisfactory. I saw the plate the next morning after it had been placed and it was simply impossible to remove it unless you used pressure. The model was straight all around on the periphery and the plaster was poured as he has suggested.

I agree with Dr. Prothero that the dry heat gives the better results. Sometimes I use the moist heat, but ofttimes with the most serious results—I might say, three times out of five. One thing I cannot quite understand is the way in which Dr. Hoff has suggested the removal of the extra rubber without any vents. If he has all the surplus coming to the outside of the flask I don't see how he gets rid of it. Of late years I have not used vents, except on the inside, but I have had them separated so that there was as little pressure as possible and in that way obviated the running of the rubber into the embrasures. I think if all of us would pay more attention to the rubber dentures we would elevate rubber work and our patients would be better served and our conscience possibly might be a little easier. I have been using for years, almost exclusively, the metal dentures. Of late years I have been using gold nearly altogether. Formerly I used aluminum and cast dentures on the lower, but I like gold better in all cases where possible.

I might say in regard to the Association, if it is not too late, I think you cannot do too much along those lines. For the last eight years, nearly, I have been in practice in South Australia, where there were about fifty dentists, but no organization. There was no organization throughout the state at all and no professional feeling. There was great jealousy. You can hardly get together

half a dozen dentists there and have them friendly. I went there from California and Honolulu, where I have had the benefits of association.

I have been a member of the California State Dental Association ever since '84, and, going abroad, I missed those associations more than anything else. When I first went to this place I started in with a few and tried to get them interested, but I found within a year that I had made a mistake. I was continually running against snags. I could get no one to cooperate with me and there was continual backbiting, so I kept to myself. After the experience I have had there, I feel sure that you cannot make any mistake in pushing this to the utmost.

*Dr. Hoff:* To prevent the red rubber running through the pink after investing the plate in the wax form in the plaster, make your investment only to the border of the plate and then when you pack your pink rubber pack it where you want it and cover it over with red rubber, and the pink rubber will not run out.

*Dr. Hines:* In investing your model set it high in the first half of the flask; that will bring it so that the ring of the flask in the second half will come well over and keep the plaster from fracture. If the plaster surrounding the model does not fracture in some way it will not let the pink rubber be forced out. This can be obviated by investing the model high in the first half of the flask, and when you come to reverse the flask the part that you pack in will be well surrounded.

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## THE RATIONAL PRINCIPLE OF LOCAL ANESTHESIA.

BY HERMANN PRINZ, M. D., D. D. S., ST. LOUIS, MO. READ BEFORE THE MISSOURI STATE DENTAL ASSOCIATION, AT SPRINGFIELD, JUNE, 1906.

The elimination of pain during surgical operations is inseparably interwoven with the history of the human race. Forever it has been the aim of those interested in the cure of bodily ills to relieve pain in some empirical manner. These efforts, however, were seemingly so futile that even as late as 1839 Velpeau was led to express his pessimism as follows: "To escape pain in surgical operations is a chimera which we are not permitted to look for in our time."

Little did he dream that he stood at the very threshold of the discovery of anesthesia and that less than a decade later the Nirvana of painless operation would be an acomplished fact.

The discovery of anesthesia is to be credited to the dental profession; and, furthermore, it is a source of patriotic pride to know that the dental and medical professions of the United States were instrumental in bestowing upon suffering humanity the blessings of relieving pain during the most dreaded operations, which led the late Samuel D. Gross to say: "If America had contributed nothing more to the stock of human happiness than anesthetics, the world would owe her an everlasting debt of gratitude."

The term anesthesia (which, by the way, was suggested in 1846 by the great physician-litterateur, Oliver Wendell Holmes, to Dr. Morton) is usually defined as an artificial deprivation of all sense of sensation, and as a consequence local anesthesia may be explained as the product of the same phenomenon in a circumscribed area of tissue. The mere absence of pain is referred to as analgesia.

From a historical viewpoint, comparatively few important factors are to be recorded prior to the introduction of cocain for such purposes. The compression of nerve trunks for the abolition of pain seems to be of an old and unknown origin, which was revived by Guy de Chauliac and Ambrose Parré, and finally found a permanent place in surgery as the Esmarch elastic bandage. Physically reducing the temperature of a part of the body by the application of cold was instituted much later, and through the efforts of Sir W. Richardson, in 1866, was placed upon a rational basis through the introduction of the ether spray. The various narcotics which were employed for internal purposes also found employment as local applications. Among others, the cataplasm of Magister Salernitanus, consisting of poppy juice, henbane and mandrake, was much lauded during the medieval age. In Egypt the suet of the crocodile, locally applied, was believed to relieve pain; and Pliny refers casually to the mystic "Stone of Memphis," which when rubbed upon the surfaces of the skin in conjunction with vinegar was said to produce local anesthetic effects. The empirical search for new methods and means pressed the mysticism of the electric current into service, opening a prolific field to the charlatan, which even to this day has not lost its charm. Richardson's voltaic narcotism for a time attracted the attention of the medical profession; and Francis, in 1858,

recommended the attachment of the electric current to the forceps for the painless extraction of the teeth, and as dental depots still offer appliances of this nature for sale, it seems that this method is still in vogue in certain parts of the country. Comparatively recently a revival of certain modifications of the above method swept over the country under the more elusive name of cataphoresis. In 1853 Alexander Wood introduced a method of general medication by means of hypodermic injections. At once it was suggested to employ such drugs as morphin or tincture of opium for the purpose of producing local anesthesia. The results were not encouraging until, in 1884, Koller advocated cocain. The general adoption of this drug finally created a new era in local anesthetics.

Local anesthesia may be produced in two definite ways—first, by the application of substances, topically or by hypodermic injection, which produce local anemia; and second, by the hypodermic injection of drugs which act as inhibitors of the sensory nerve fibers.

According to present therapeutical conceptions it is generally recognized that a drug or combination of drugs, which simultaneously produces local anemia and inhibition of the sensory nerves in a circumscribed area of tissue is the logical solution of the question of local anesthesia. Certain important factors, however, relative to the physiological and physical action of the solution employed for hypodermic injection upon the cell govern the successful application of such methods. It is of prime importance, therefore, to comply with the laws regulating the absorption of injected solutions, viz., osmotic pressure.

If we separate two solutions of salt of different concentration by a permeable membrane, a continuous current of salt and water results, which ceases only after equalization of the density of the two liquids. So equal osmotic pressure (according to Boyle-van't Hoff's law), is established. The current passes in both directions, drawing salt from the stronger to the weaker solution and water vice versa, until osmotic equilibrium is obtained. The resultant solutions are termed isotonic (De Vries). In organized nature these osmotic interchanges play an important factor in regulating the tissue fluids. The life of the cell depends upon the continuous passage of these tissue fluids, which furnish nutrient materials, consisting of water, salt and albumen. These chemicals are normally present in certain definite proportions. A further important factor teaches us that

all aqueous solutions which are isotonic possess the same freezing point. This law of physical chemistry has materially simplified the preparation of such solutions. The freezing point of human blood, lymph, serum, etc., has been found to equal approximately 0.55° C., which in turn corresponds to a 0.9% sodium chlorid solution. Such a solution is termed a physiological salt solution. A slight deviation above and below the normal percentage of the solid constituents is permissible. When physiological salt solution is injected into the tissues in moderate quantities neither swelling nor shrinkage of the cell as such occurs; therefore no irritation results, and no pain is felt. Other bodies which are equally soluble in water act in the same manner, with the exception of the salts of the alkali and earth metals, such as potassium or sodium bromid. The latter substances produce intense physical irritation, followed, however, by prolonged anesthesia, and in consequence are termed by Liebrich painful anesthetics.

### MEANS OF PRODUCING LOCAL ANEMIA.

Local anemia or ischamia, viz., a temporary constriction of circulation, prevents, as it has been experimentally shown, the rapid absorption of fluids which are injected into the affected area. The more important means applied for such purposes are:

1. The Esmarch elastic bandage.
2. The application of cold.
3. The extract of the suprarenal gland.

Some observers have maintained that local anemia, as such, produces anesthesia. This, however, is not the case. It is merely an important means to confine the injected anesthetic to the anemic region and thus bring about an increased and prolonged action of the drug, and also enhance its deeper action. Consequently the concentration of the anesthetic solution may be of a lower percentage, which, of course, lessens the danger of intoxication.

For plausible reasons the Esmarch elastic bandage cannot be made use of for dental operations. The application of cold, especially chlorid of ethyl in the form of a spray, for such purposes is of some importance. Ethyl chlorid boils at about 12° C., and a stream of this chemical, eliminated from a capillary tube by the heat of the hand and directed upon the gum tissue, abstracts heat very rapidly until all functions of the tissues, including those of the sensory nerves, are

temporarily suspended. This anesthesia is only superficial and of rather short duration. Great care should be exercised in not "over-freezing" the tissues, as gangrene is liable to result.

Within the last decade the active principle of the suprarenal gland has demanded extensive comments in therapeutical literature. The extract of the gland when introduced into the system, even in extremely small doses, temporarily raises the blood pressure. Large doses finally reduce the blood pressure and heart failure results; the respiration at first quickly increases, but slows down and finally stops with the last expiration. When injected, a pronounced local anemia is produced.

Ever since the introduction of the suprarenal gland into therapeutics a large number of preparations have flooded the country, which are advertised under a variety of names. Probably the best-known product is adrenalin. It is the active principle of the suprarenal gland as isolated by Takamine and sold in the form of the soluble hydrochlorid salt. On account of its powerful action it is usually offered as a diluted solution. This latter solution is marketed by Parke, Davis & Co., and presents adrenalin chlorid dissolved in normal sodium chlorid solution in the proportion of 1 to 1,000, with 0.5% of chloretone added to it as a preservative, and whenever in the future we refer to adrenalin we wish it to be understood that the above solution is meant.

It is somewhat difficult to say who first suggested adrenalin as a dental remedy. It seems to us, however, that Dr. G. T. Carpenter of Chicago (1901) deserves the right of priority. At first it was advocated as a local hemostatic, and only later was it combined with cocain and other anesthetics for the purpose of reducing the toxic danger of these drugs. It was soon found that adrenalin exercises a powerful action upon the circulaton, and requires great caution in its administration. The increased blood pressure manifests itself in a rapid heart-beat and a slight tremor of the limbs. In large doses it discolors the skin, resembling Addison's disease, and occasionally produces local gangrene. All these symptoms may be avoided by properly adjusting the dose. We may safely say that two drops of adrenalin, corresponding to about 1-500 grain of adrenalin chlorid, added to one cc (15 drops) of a suitable cocain solution, is amply sufficient to produce the desired effect.

## THE LOCAL ANESTHETICS.

From the large number of those chemicals which are advocated for the purpose of producing local anesthesia, I have selected for my present consideration only three, viz., cocain, eucain and tropacocain. These three drugs represent practically the majority of those agents which are employed in dentistry for the purpose in view. While eucain and tropacocain present certain apparent advantages over cocain, viz., their solution can be sterilized by boiling and they are less toxic, they also possess certain disadvantages. They require larger doses to produce the desired effect, and, especially, eucain is prone to establish edema. There are certain other important disadvantages, however, associated with eucain and tropacocain when employed in conjunction with adrenalin, to which we will refer later on.

Taking cocain as the prototype of a local anesthetic, we may state, without going too deep into detail, that its physiological action manifests itself as a general protoplasm poison and that it possesses a definite selective power for the sensory nerve elements, which convey sensation of pain. It possesses a definite chemical affinity for living protoplasm, with which it enters into a loose combination. This temporary union is the factor which produces its local anesthetic effect. In due time this union breaks up, again releasing the cocain—not as such, however, but as an inert compound of some simpler structure. In other words, the tissues rid themselves of the poison in some unknown manner. The heart is powerfully accelerated by larger doses of cocain, finally slowing down and becoming weak. The respiration is also at first stimulated, later on becoming depressed and dyspneic, and death results from its gradual secession. No direct antidotes are known, consequently the treatment of general intoxication is purely symptomatic. Recumbent position of the body and inhalation of a few drops of amyl nitrate to overcome anemia of the brain are the first important steps in dealing with collapse, which should be followed in severe cases by stimulation of the heart with small doses of nitroglycerin and injection of strychnin, together with artificial respiration.

The relative toxicity of a given quantity of cocain in solution depends upon the concentration of the solution. Reclus and others have clearly demonstrated that a fixed quantity of cocain in 5% or 10% solution is almost equally as poisonous as five times the

same quantity in a 1.5% solution. From the extensive literature on the subject, we are safe in fixing the strength of the solution for dental purposes at 1%. This quantity of cocain raises the freezing point of distilled water just a little above 0.1° C. To obtain an isotonic solution corresponding to the freezing point of the blood 0.8% of sodium chlorid must be added. Having thus prepared a cocain solution which is equal to the blood in its osmotic pressure upon the cell wall, it is now necessary to aid the slightly vasoconstrictor power of the drug by the addition of a moderate quantity of adrenalin, thus increasing the confinement of the solution to the injected area by producing a higher anemia, for the twofold purpose of acting as a means of increasing the anesthetic effect of cocain and lessening its toxicity upon the general system by slower absorption. As stated above, two drops of adrenalin added to one cc. of the isotonic cocain solution is sufficient. If adrenalin is employed in conjunction with eucain, much of its vasoconstrictor power is lost, while tropacocain totally neutralizes this action of adrenalin. From the above statement it is clear that the local anemia is produced by adrenalin and the local anesthesia by cocain. The combination of the two phenomena, however, is imperative to produce the desired results. The cocain-adrenalin solution should be made fresh at the time it is used if perfect results are expected. Nothing in the nature of a preservative or so-called antidote should be added; at their best they are worthless.

In this communication, according to the title of the paper, I have said nothing about the instruments to be used, the technique of the injection and the employment of solutions for special purposes, such as the much-lauded pressure anesthesia. Each of these factors requires detailed discussion in itself and is left for some future period to be dealt with.

Discussion.—*Dr. F. G. Worthley,* Kansas City: I always feel hesitation in starting the discussion of a paper by Dr. Prinz. He investigates so thoroughly that he does not leave room for discussion. He is one of those observers who, if a bacteriologist, would take one germ and study it for years so thoroughly that he would know it so well that he would recognize that germ if he met it in Arkansas. Last year he had a list of the names of nitrate of silver, and when I first saw that list I thought it was a catalogue of breakfast foods. If Dr. Prinz says a 1% solution of cocain

is the proper strength, I believe he is right. I have a considerable knowledge of local anesthetics from a clinical standpoint, and have used a stronger solution than that, but I have not the knowledge of anesthetics from a scientific standpoint that he has. As regards the value of the solution and the principles involved in its preparation, I have no doubt that everything Dr. Prinz has said is scientifically true.

*Dr. J. D. Patterson,* Kansas City: I have always been a little suspicious of the value of adrenalin after reading of some experiments with it in Germany, where it was claimed that the use of adrenalin in connection with cocain was distinctly objectionable and it was strongly advised against. I have used a pressure anesthesia in various forms, but not for a considerable time, for I had serious difficulty in one or two cases. In regard to the different solutions and their safety, the fact remains that one may use a simple cocain solution for many years and have no difficulty whatever, and then comes the day when the difficulty occurs; and for this reason it has been entirely banished from my office. The solution itself may be the best in the world, the syringe may be absolutely aseptic, yet we are always entering a field of danger. I know no man can be more careful than I am, yet my experience has been such that for all purposes for which local anesthesia is used I advise all my friends to use nitrous oxid gas. We know of its safety. It has been proved for so many decades, and we know there is danger in the other. We know, too, there is no operation but can be accomplished with the use of nitrous oxid gas. Then why take the risk? I went on using cocain for years and had no trouble, and I might have gone on using it the rest of my life and had no trouble; but if you can arrive at the same degree of pain-saving by safe methods it is your duty to adopt those that are safe. And so I advise all students not to experiment with somnoform, etc., when we have an absolutely safe anesthetic in nitrous oxid gas. As a well-known writer has said, all the substances belonging to that class are so potent and produce such pronounced effects that there must be danger in them. The gas will take the place of these compounds, and let us stand by the friend that has stood by us in the matter of safety. Some one has asked about cocain in taking out the pulp. I was not talking about that; I had reference to injected preparations.

*Dr. Prinz, closing discussion:* There is very little to say, for the

reason that I covered all that I wished to state in my paper. The work connected with this paper is this: The use of cocain as a means of producing local anesthesia has been empirical in its nature. The questions how and why it acts have never been worked out, and only within the last two years have we had a full conception of the facts, which make it clear how we can administer cocain locally so that it will be comparatively safe. In the future these points will be dwelt upon at greater length, and I hope at a later date to present to you further developments.

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HINTS TO AVOID WRONGLY PLACING THE CAST ON THE ARTICULATOR.—A cast may be placed wrongly on an articulator in various ways, thus: (1) By being placed too far forward or too far back; (2) by being placed so that the plane of occlusion of the teeth will not be directed to the joint; (3) by being placed askew, so that its heels are not equidistant from the joint adjoining each; and (4) by being tilted, so that the left side is higher proportionately than the right side or *vice versa*. And lastly, the error may be in a combination of one or more of these four malpositions.—STEWART J. SPENCE, *Dentist's Magazine*.

A FEW IDEAS ON "TAKING THE BITE."—In "taking the bite" the greatest difficulty to be overcome is the tendency the patient exhibits—apparently from over-anxiety to do the right thing—of protruding the mandible in closing, and this is particularly the case if the term "bite" is used in giving instructions to the patient as to how to close the jaws. Avoid the term "bite," then, and instead, direct the patient to turn the tip of the tongue upward and backward as far as possible. It is well to have the patient do this a time or two before placing the trial plates in position in the mouth, also after these are in position. Then, when the patient understands what is required of him or her, and the tip of the tongue is back, *as far as it can go*, direct the patient to "close the jaws." This "upward" and "backward" movement will be found to follow the median line of the vault of the oral cavity directly, as we cannot place the tongue's tip upward and backward as far as possible without following the median line, and this overcomes the side bite—either to the left or to the right. It is therefore an inadvertent act on the part of the patient. Moreover, this method brings into requisition all the muscles which are connected either directly or indirectly with the tongue, and I might say that these are many—the geniohyoglossus, the hyoglossus, the styloglossus, the stylopharyngeus, the middle constrictor of the pharynx, the stylohyoid ligament; and even such muscles as the mylohyoid, digastric, sternohyoid and omohyoid seem to be indirectly concerned. All these muscles, by this method, seem to be employed in bringing the mandible into its normal relation to the maxilla, and in so doing they all seem to act together.—W. NELSON CUTHBERT, *Dental Practice*.

# Digests.

THE MECHANICAL FORMATION OF THE SET OF TEETH. By Dr. Alfred Körbitz, Berlin, Germany. (Translated from the Viertelpahrsschift für Zahnheilkunde.) All authors confirm the observation that irregularities in the deciduous set of teeth occur much more rarely than in the permanent set and seek to explain this fact in various ways; thus, Warnekros, for example, refers it to the uniformity of the food, and, therefore, to the function of the maxillæ and the teeth of the child.

If we examine the maxillæ of the newly born, we find that the dental arches of the deciduous set of teeth are preformed intrauterine, inasmuch as the tooth rudiments (zahnscherbchen) are situated directly under the thin osseous cover of the part corresponding to the alveolar edge of the still very undeveloped bone. This arrangement is not altered through the subsequent development of the maxillæ—i. e., especially of the maxillary bodies—so that, therefore, the deciduous tooth needs only to proceed from the primary alveolus in order to take its place in the set of teeth. It is quite different in regard to the position of the permanent teeth, as we find them before their eruption in the infantile maxillæ. If, however, all development processes in the youthful organism proceed with a fresher impulse than in the advanced, there are difficulties opposed to the second dentition, in the greater density of the osseous tissue and in the process of the change of the teeth, which are foreign to the first dentition.

In addition to all this, it appears to me important that the second dentition is influenced by unequally stronger functional performances than the first dentition. I have not found a complete representation of the processes which occur in the building up of the permanent set of teeth in any dental text-book; and, as we also fail to find it in those books which deal with the origin and treatment of the irregular set of teeth, I thought that I might the better employ this subject for a paper than the internal dentition processes, which have been so often and so thoroughly represented but are of much less moment to the practical interest of the dentist than the coarser external and more mechanical conditions which dominate the maxillæ and the teeth, after the eruption of the latter, and

which are accessible to the control and influence of the dentist. For the explanation of most of the irregularities in the set of teeth it was formerly the custom to employ the expression "want of space." According to the manner in which this expression was used, it was only an expression such as is characterized in the Mephistophelian expression where ideas are wanting; and the idea in this connection which was absent above all others, was the idea of the functional self-formation which, in reference to the maxillæ, has only recently become familiar through the labors of Walkhoff.

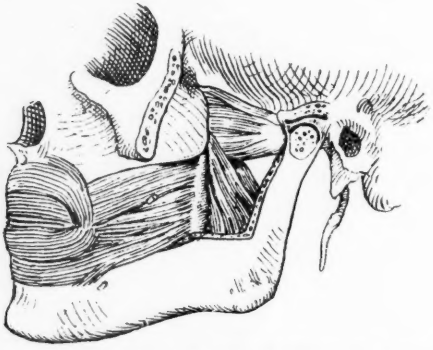
If, for example, we read Sternfeld's disquisition, in reference to the anomalies of the set of teeth, in Scheff's Handbuch, we observe that this author is not conscious how the formation of the alveolar processes of the dental arches—in fact, of the entire set of teeth—is dominated by the one chief factor of *function*, and how all other factors, such as heredity, constitutional diseases, and so forth, are only of accessory or indirect importance. On the whole, we might reverse the self-evident proposition that only a normal set of teeth exercises normal functions in this way; only with normal functions can a normal set of teeth develop and exist, for we often see, in the course of years, processes of transformation which, in periods of more advanced age, produce anomalies similar to those that occur in connection with dentition. What functions are exercised in this connection, and what is their importance individually, are questions which demand our greatest interest, and which still await an exhaustive reply.

In the formation of the dental arches, we have always rightly accorded great importance to the tongue—the voluminous and most active muscle. Its most important functions for the teeth are the forming and movement of the morsels of food, and the sound formation and pressure which the relaxed tongue exercises upon the lingual surfaces of the mandibular teeth. How intimate the mutual relations are between dental arch and tongue is clear from this: the tongue becomes larger when the teeth are lost; on the other hand, pathological macroglossia ensues with deformation of the dental arches, as described by Virchow and others. If we now note that in the mandible the teeth always erupt lingually from the places of the milk teeth, we scarcely need further proof to the effect that the formation of the mandibular arch in the main is dependent upon the tongue. The direct influence of the tongue upon the upper teeth

appears to be much slighter; as a rule, they are erupted labially from the places of the deciduous teeth. Since, however, the two dental arches influence each other mutually, whereby, according to Angle's conception, the lower represents the patrix over which the upper forms itself, the tongue in this connection is no doubt also of influence in regard to the formation of the maxillary arch.

The next muscles which have a direct influence upon the teeth are the *M. buccinatores* and *orbicularis,* which are stretched around the alveolar arch and influence it both passively and actively in regard to contraction (Fig. 1). The teeth in the maxilla, as we have observed, appear labially from the places of the deciduous teeth, and these muscles may contribute to the articulating of the maxillary arch with the mandibular arch which we have mentioned. For

FIG. 1



many functions of these muscles the maxillary arch serves as a support, a point which can be easily demonstrated experimentally—when, for example, we shape the lips for whistling a high note, or for a distinct "sh," or for the sipping of a liquid. In these experiments the pressure directed against the canines and bicuspids is distinctly felt. The pressure arises through the contemporaneous contraction of the *M. orbicularis* and *buccinatores,* which latter fix the angles of the mouth posteriorwards and thus enable the lips to act. Only through such functional demands can the contracted maxilla be accounted for, as indeed it has been accounted for by Charles Tomes, Walkhoff, and others.

Let us now direct our attention from the dental arches in their

entirety to the fate of the individual tooth after its eruption, and we shall see that, under the pressure of the muscles in the mandible from within, and in the maxilla from without, it approaches its antagonist and receives through the occluding surfaces of the articulation a more exact position. By this means a large free space, relatively, is left in the eruptive direction of the individual tooth, within which space it reaches its normal position, because, through the movements of the mandible, the mutual gripping of the antagonists is favored. Warnekros first drew attention to the part which the mobility of the mandibular arch plays, in general, during the formation of the maxillary arch.

With this we have reached the third group of muscles, which is situated in the maxillæ, viz., the masticatory muscles. A direct influence of these upon the teeth does not take place; great, however, is the indirect action. The internal and external development and nutrition naturally depend upon the employment of the maxillæ for mastication, since permanently unsteady teeth are seen to fall out through atrophy of the alveoli. But during the formation of the developing set of teeth we must, as we have already observed, also think of the masticatory muscles. The mandibular arch precedes the maxillary arch in dentition, and, being more compact in structure, its activity exercises a shaping influence upon the maxillary arch which is greater than the counter action of the maxillary arch upon the mandibular arch. Finally, through masticatory pressure the teeth are fixed in their position in the bone. On the other hand, through the masticatory pressure lasting a long time and being insufficiently distributed or unfavorable in its action on individual teeth or on all the teeth, atrophic conditions may be produced. The masticatory muscles are only active in a normal way during mastication or during occlusion of the jaws, such as is produced during the act of deglutition, but only in a passing manner.

When the entire muscular apparatus which we have observed is relaxed, the following situation is produced: The lips and cheek parts lie against the dental arches, chiefly against the maxillary, the tongue fills the mandibular arch and sinks down posteriorly and below, and the sets of teeth are separated from each other, while the mandible is maintained by the bands and the tonus of the masticatory muscles. This condition can only exist in a passing manner,

for, through the permanent draught exercised by the mandible and the tongue, the burdened muscles soon become fatigued and become involuntarily contracted, or the mandible sinks far down and the mouth opens (Mundspalte), as seen in persons sleeping in a sitting posture. But even if this does not occur—if during sleep, when a person lies on his back, the mouth remains closed—there is an impediment to nasal breathing which leads to snoring or to mouth-breathing. The cause of this impediment we find in the sinking of the soft palate posteriorly, which is set swinging by the stream of air which passes between it and the posterior pharyngeal wall.

We therefore see that this state does not represent the physiological condition of the rest of the buccal cavity. To know this, however, is important, because, by the permanency of its action, it precedes all other conditions, and must, according to its nature, have a certain influence. The following experiments will give some explanation:

I.—Let us close the previously opened mouth slowly until the lips and the first tooth-cusps touch. If we now relax the muscles there is at once a feeling of discomfort, of compulsion (Gezwungenen).

II.—If, however, we close the mouth and perform at the same time the act of deglutition, the muscles may be relaxed, and we have a feeling of rest and of a natural condition.

If we look for the differences of the two conditions, it is seen that during deglutition there takes place a suction of the tongue against the palate on the one hand, and of the mandible with lips, cheeks and buccal floor against the maxilla on the other hand, and that the suction action continues unchanged if, after the relaxation of the muscles, the mandible sinks a little so that the sets of teeth no longer meet.

These appearances were described by Mezger in the year 1875, in order to demonstrate that the mandible in a condition of rest is borne by the pressure of the external atmosphere. If we now ask what is the meaning of these results, in regard to the sets of teeth, we shall soon recognize that they are of the very greatest influence in their formation. Kuhnert has very exhaustively dealt with this influence in his monograph on the self-regulation of the set of teeth, but he has, however, so it seems to me, not sufficiently considered some factors.

One thing is clear: a suction space existing within the buccal

cavity necessitates external atmospheric pressure action. Its direction, however, depends upon the localization of this suction space and of the walls which represent it. If we assume, as Mezger and Kuhnert appear to do, that the suction space corresponds to the *cavum oris*, it would be formed downward and posteriorward by the tongue, upward by the hard palate, forward and at the sides through the alveolar and dental arches—i. e., by the cheeks and the lips lying upon them. Under these circumstances the most important action upon the dental arches would be a pressure directed from the front and the sides. A pressure of the mandible against the maxilla such as is assumed by Kuhnert can only take place at the moment of the act of deglutition and the act of suction. After the relaxation of the muscles the mandible theoretically might remain in the position it assumed—viz., "in a state of suspension"—therefore it would never exercise any pressure. In reality, however, the mandible, after the completed act of deglutition or suction, always sinks down a little. The simple explanation of this is that the act of suction which is produced by the muscles of the tongue is somewhat less after their relaxation than during their action. We may perform the act of suction ever so forcibly, and yet at the moment of complete muscular relaxation the mandible sinks down a little. If we voluntarily separate the maxillæ, the lips become more tightly attached and the cheeks sink in at the sides between the molar teeth. Both appearances are explained by the external pressure.

Let us recapitulate the pressure actions which influence the maxillary arch:

1. Passive pressure of the soft tissues.
2. Active pressure of the muscles.
3. Atmospheric air pressure.

All these components unite in the tendency to contract the maxillary arch.

Now, if we look for factors which may compensate these forces and produce equilibrium, we find:

a. The architectural curve of the maxillary arch.

b. The functional irritation exercised by the active mandibular arch.

c. Pressure action of the adhering tongue.

That these factors are really the factors which aid in forming

and maintaining the normal maxillary arch, I seek especially to prove from the subsequent phenomena which arise when one or more of them do not come into action. Now, in regard to the architectural curve of the arch, we mean that a complete arch, consisting either of deciduous or of permanent teeth, cannot easily be deformed, because one tooth supports the other. The moment, however, a stone of the structure is removed, the arch loses its mechanical power of resistance. If the curve thus protects the arch from being pressed out of form, on the other hand the pressure resting upon it always provides for a tight setting together of the teeth. We therefore only see gaps in exceptional cases where the dental arch is intact, and then we rightly look for some special cause. Thus Angle, for instance, explains the diastema which occurs between the central upper incisors through the excessive development of the *lig. labii sup.* However, as soon as the continuity of the curve is interrupted—be it through extraction, or through the non-appearance of a tooth, or through its eruption outside the dental arch—processes begin which appear to have for their object the closing of the gap, and in so far they only correspond to the function of the external pressure actions. In these processes we certainly may distinguish two phases. The first relates to the teeth contiguous to the gap, which soon approach each other—a phenomenon which Walkhoff has explained as due to the relaxation of the osseous tissue produced by the extraction. The second consists of a flattening of the upper part of the arch, which also leads to the closing of the gap; this is not produced by a moving of the teeth, but through a transformation of the alveolar process.

Fig. 5 exhibits a maxilla in which these processes have occurred upon the right side after the extraction of a molar. On the left side the flattening of the arch has occurred through too early loss of the deciduous canine. It has, however, been stopped by the erupting permanent canine, which nearly reaches the contour of the real curve. If, in such cases, the canine appears still later, the flattening of the curve, especially in the sagittal direction, may in the meantime have so far advanced that a decreased and closed dental arch has developed, in which the canines find no space; they then appear very far above the alveolar arch, mostly on the outside. Such a case is shown in Fig. 2, the profile of a girl eighteen years old, which almost leads to the conclusion that it is a case of prognathism.

The front teeth of the mandible were crowded closely against each other and over each other, and inclined lingualward.

But, also, when all the teeth in the maxilla occupy their places in the alveolar arch, the external pressure actions may produce a decrease in the size of it by forcing individual teeth over each other, in so far as the nutritive irritant action of the normal function is missing, owing to defective relationship to the mandibular arch. Further, in those cases of receding mandible in which the lower lip is pressed between the upper and lower front teeth (Fig. 3), followed by a direction rather opposite to the one represented, we

FIG. 2.

FIG. 3.

see the contraction of the upper curve brought about. We then find the upper front teeth turned, forced together, and inclined lingualward. Assuming these conditions, the normal arch can scarcely be developed, because the teeth yield to the external pressure actions during their eruption; but where a complete arch only later loses its functional relationship (Inanspruchnahme), we see it gradually lose its form.

Fig. 4 exhibits the maxilla of a young woman twenty-one years old, in whose case, in the course of years, the left lateral incisor was pushed more and more out of the arch over the central incisor. The explanation of this remarkable phenomenon is found in the mandibular arch, in which the median line is pushed to the right

to the extent of the width of a lower incisor; the left half of the arch is flattened to the extent of the width of this tooth. The left half of the maxillary arch, notwithstanding its architecture, was transformed in a corresponding manner, whereby, relatively, the weakest tooth and, owing to its narrow crown, the least burdened from without—viz., the lateral incisor—had to give way.

In this manner the external pressure actions not only provided for

FIG. 4.

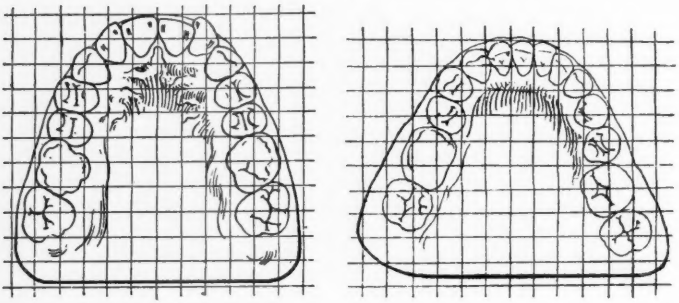


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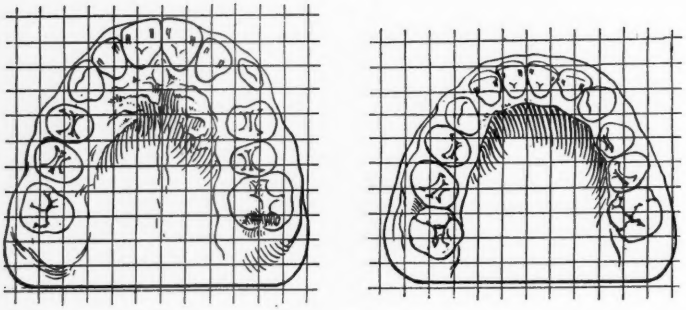
FIG. 5.



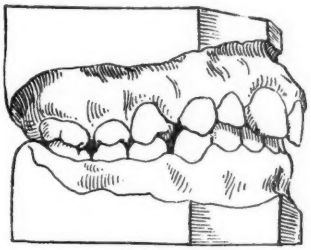
M.

the closing in of the maxillary arch, but also for its articulation with the mandibular arch. Under these processes the architecture of the maxillary arch may be broken into; in the beginning it impedes and delays the articulation referred to. Examples which illustrate this are shown in Figs. 6 and 7.

The set of teeth exhibited in Fig. 5 possesses a decreased man-

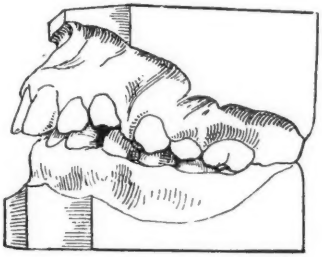
dibular arch; it recedes on both sides to the extent of a whole tooth, whereby the slight power of resistance of the maxillary arch, which has already been discussed, is further explained. We see it flattened on both sides. On the right side, however, where the architecture is interrupted through the loss of a molar, the articulation has reached great completeness (Fig. 6). Here, of course, we must accord a

FIG. 6.



decided influence to the oblique planes of the surfaces of articulation. In the bicuspids we might even look for the chief action to the interpenetrating cusps. In the front teeth, however, we decidedly require for an explanation the external pressure actions. Nevertheless, in regard to this also, the surfaces of articulation play a special part in regard to the exact placement of the tooth. Thus it would

FIG. 7.



counteract a turning in the incisor teeth, and in the canines a distal movement beyond the lower in conjunction with the external pressure (Fig. 6).

Quite other conditions are shown by the left side of the set of teeth in Fig. 7, where no tooth has been lost. Here the maxillary arch,

through internal resistance, has partly prevented this articulation, and we see the first bicuspid entirely outside the mandibular arch.

If the contraction of the maxillary arch is not completed, so that the central incisors are still in a prognathous position and gaps have also remained on the right side, the reason is that the mandibular incisors, for want of a normal counter set, have continued their growth until their cutting edges reach the tubercula of the uppers near the necks of the teeth. By this means the latter are fixed in their position. Thus all the factors considered would seem to have found their explanation, and it now remains to make a counter-trial, and to ascertain whether our conception can still be maintained if, under totally altered conditions, other forms arise. This is the case in mouth-breathing—a fact which has not escaped the oldest observers. If, however, the etiological connection were known, the detailed explanations of the pathological phenomena lead to contradictions. Thus Port says that the maxillary arch in mouth-breathers on the whole remains small, and that, besides, it is pressed together laterally by the soft tissues of the cheek; furthermore, he attributes influence to the pressure which in the nose is negative and in the mouth positive.

In regard to the first, Kuhnert may not be wrong in declaring as very unimportant the self-pressure of the cheek upon the alveolar arches, because these soft parts are somewhat smoothly stretched from the zygomatic arch and maxillary body to the mandible. In regard, however, to the conditions of pressure in every case, the alveolar arch of the mouth-breather is exposed to an unequally slighter amount of external pressure action than that of the nose-breather, according to our previous disquisitions. To this also an oblique position of the upper front teeth forward and outward regularly corresponds. The most marked characteristic of the mouth-breather is, however, the "high" or keel-shaped palate, and all authors appear to have been shipwrecked in endeavoring to explain its meaning. Port's idea, that the abnormal pressure conditions produce it, is in contradiction to his own observation according to which the "height" of the palate is only relatively, not absolutely, abnormal.

If it is a question of the shortening of the transverse axis of the arch, there are pressure actions here missing to which would have to be ascribed such a shortening, especially if neither gaps nor dis-

turbances in the articulation offer a predisposition to it. It therefore appears that that form of the hard palate must be referred to defective development, and I believe that I have succeeded in so referring it.

We know that the development of the nasal cavity is retarded if the nutritive irritant action of the air we breathe is missing, and as the hard palate forms the floor of the nasal cavity the connection in this direction becomes clear. With the keel-shaped palate, however, it is not a question only of the narrowness of the palatine roof, but of the alveolar processes appearing to be just "pressed together." This fact I likewise explain through the absence of functional irritation, which in a normal manner is performed by the tongue.

We assumed above that the suction space existing when the mouth is at rest corresponded to the *cavum oris,* and did not meet with any contradictions. On the other hand, we were able to decide, also by experiment, that in the act of deglutition the tongue is sucked against the hard palate and adheres there, and that even when the mouth is opened carefully the tongue remains sucked up. The tongue therefore carries itself, independently of the mandible, through the suction space formed at the hard palate. This fact, stated by Donders, who relies upon the experiments of Mezger, now receives especial importance. Not only has the suction space of the mandible not to carry the tongue—i. e., that the outer relative pressure is slight—but there is also an action of the tongue upon the maxilla which cannot be anything else than an expansion, since the edges of the tongue in every position are pressed against the alveolar ridge of the dental arch, while the suction space existing at the back of the tongue acts in the sense of a flattening of the roof. It is just these actions which are entirely absent in the mouth-breather, for he holds neither the tongue nor the mandible sucked up.

By this means we can recognize the direct influence of the tongue upon the formation of the maxillary arch—indeed, of the entire palatine roof. Here analogous relations exist, as between the tongue and the mandibular arch. It is also a question in the maxilla of a functional articulation, which we might have assumed *a priori.*

I am conscious of only having given, in the preceding pages, a hurried outline of a representation, in regard to the formation of

the set of teeth. To deal with the subject fully, not only important individual points would have to be looked into, but also, above all things, the growth of the maxillæ during that epoch would have to be investigated. This the more so, as we have no conclusive investigations before us, and because its study in connection with the development of the set of teeth, so it seems to me, would afford us new explanations. I believe I have proved, however, that the formation of the permanent set of teeth proceeds under very distinct mechanical actions, and that function is the shaping principle.—*Ash's Quarterly.*

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CHEMISTRY: ITS RELATION TO DENTISTRY: A PLEA FOR A BROADER AND MORE SCIENTIFIC RESEARCH. By Dr. William A. Lovett, Brewton, Ala. In attempting to discuss so broad and scientific a subject as that of chemistry, I appreciate keenly the difficulties of the task assigned me. Its very broadness renders it exceedingly tedious to condense in a short paper that which may be of most interest to men who are thoroughly familiar with the subject. It shall be my purpose to make a special plea for a deeper and more scientific research by the dental profession generally, to the end that we may be better able to give practical application of chemical laws to dental practice.

In 1889, Dr. Mitchell predicted that within ten years the course in chemistry for the dental student would be distinct from that of the medical student, except possibly in a few minor particulars, and that he knew of no professional man to whom chemistry would prove more valuable than the dentist. "Many of the most perplexing problems," said he, "with which the dentist has now to deal, will be solved in due time by the dental chemist."

This must be true, for to whom else may we look for a solution of these problems but to a chemist who is also a dentist, and who knows what these problems are, and who is sufficiently interested and competent to carry on a scientific research of this kind? No abbreviation of the study of the fundamental chemical laws would result from this special course. It would be necessary to cover the same ground we do now, extending our studies and experiments into special lines more particularly suited to the requirements of the dental practitioner.

An elementary knowledge, at least, of the subjects of gravitation,

heat, light, sound, electricity, magnetism, pneumatics and hydrostatics cannot be too strongly recommended for the student of chemistry. Information acquired of these topics will prove invaluable to the dentist in his daily practice. Since the educational requirements of prospective dental students is so limited that they are not expected to have much, if any, knowledge of physics before entering our dental colleges, I have long thought that these institutions, by adding this branch to their curriculi, would take an advanced step toward a better and more extended system of dental education. Some schools have done this, but I am not sure that it is sufficiently emphasized.

It is to be deplored that, though the educational requirements for entrance to most of our dental schools are very insignificant, some of them do not even inquire of the matriculant as to his capability of meeting these requisites. They thus shirk the responsibility imposed on them by the National Association of Dental Faculties, with the result that we have men entering the profession who cannot read and write the English language with any degree of correctness. Our medical brethren can complain of this sad condition of affairs, also. It should be corrected by all means and the standard for entrance raised even higher than it is to-day, or else the burden of keeping up the high ideals of our profession eventually will fall upon the shoulders of a few men who love their calling and are loyal to its every interest.

It has been said that American dentists are the best dentists in the world, and when located in foreign countries are sought in preference to all others. It is also said that our best cements are imported from Germany. Whether this last statement is true or not I do not know, but I think you will agree with me that the German scientists, by their thorough knowledge and constant experimentation, have given us many things which, perhaps, would never have been discovered had it not been for their devotion to science and untiring energies exerted in promoting its interests. I am proud of the fact, if it be a fact, that the American dentist leads in operative and mechanical skill, but if we take these acquirements as our sole claim for ranking dentistry as a branch of one of the learned professions, we at once unprofessionalize ourselves, in that ours would no longer be "an occupation that properly involves a liberal education, or its equivalent, and mental rather than manual labor."

We might just as well place engineers and mechanics generally among the learned professions as to rank dentistry with them if we fail to appreciate the necessity of having a high educational standard as a requirement for entrance in our dental schools, or eliminate any of the sciences prescribed for our course of study.

Dentistry is conceded to be a specialty of medicine by the broadest-minded men of that profession, and is recognized as such, I believe, by the American Medical Association. Of course I am aware that there are many medical practitioners who believe that all there is to dentistry is "plugging" and "pulling" teeth, and making rubber plates. You can usually size up the calibre of the M. D. who knows no more than that about our capabilities. He is usually the fellow who knows just enough medicine to give calomel when the tongue is badly coated, administer morphia when his patient is suffering intense pain, ask a few questions, grunt in order to prevent showing his ignorance, and prescribe some patent or pharmaceutical preparation because the manufacturer of it says it will cure colic or is good for rheumatism. He likes to take a "pull" at all the teeth he can get hold of just to show his patients he can "pull" them, or else test the dentist's skill by leaving the roots for him to extract. I do not believe the higher class of medical practitioners will take offense at what I have said, because they have men in their branch of the profession of whom they are just as ashamed as we are of some in the branch which we represent.

A deeper and broader research and study of chemistry would not detract from our operative ability, but would enhance it materially and would enable us to place our profession on a higher scientific plane and command a greater respect from our brethren of the medical profession because of our ability as scientists.

Bacteriology, the use of the microscope, the study of histology, pathology, materia medica, and therapy are all better understood if we have a thorough knowledge of chemistry. Indeed it cannot be dispensed with if we would really understand these other branches and give them practical application. I want to say, by way of parenthesis, that the discoveries which bacteriologists have made and are still making in reference to the causation of disease impose upon us the imperative duty of familiarizing ourselves with the bacteriology of the mouth, in order that we may pursue a scientific study of dental and oral diseases, and be capable of treat-

ing them intelligently and successfully. No fewer than one hundred different or apparently different forms and species of bacteria have been isolated from specimens procured from the human mouth, and we should acquaint ourselves with their study. To do this we must know what particular stains to use in the preparation of specimens, what chemicals best harden and preserve them, and how to make the different chemical tests to distinguish one bacillus from one another. This involves an adequate knowledge of chemistry. Only a few of these bacteria have yet been cultivated by artificial media, and the identity of many is very confusing. The profession awaits with interest the discoveries that may be made in this science. The question that confronts us is: Shall we, who are the most interested in these expositions, sit quietly by and expect others to do for us that which we should do for ourselves, and the doing of which would raise us greatly in the estimation of all educated people?

I am aware that this science is now being taught in our professional schools, but when many of us present were at college its value as a special study to the dentist was not recognized as it is to-day, and the germ theory was not so universally accepted. The young graduate, as he emerges from the halls of his alma mater now, is thoroughly inoculated with this science, but we cannot expect the infection to spread to the older men of the profession and our field of usefulness be improved, if they allow these germs of knowledge to be hermetically sealed from those influences and media that will increase not only the amount of knowledge they already possess, but disseminate it among others with ever increasing potency and usefulness. Neither can we, who had not the advantage of training in this branch, allow ourselves to become mere fungi and cling to others, deriving from them all our intellectual and scientific nourishment. We, too, have as our rightful heritage a part in this great work.

Dental and medical students, as a rule, look upon chemistry as a great bugaboo—something to be dreaded and something for which they expect to have no use in the coming years of an active practice. While it may not be understood so easily as some of our other branches of study, if we will but get the idea out of our minds that it is so very difficult to learn, and take up its study without prejudice, I am sure it will prove fascinating and profitable.

It may be interesting to notice something of the history of this

great science. Of all the nations of antiquity, the Egyptians appear to have had the greatest chemical knowledge. As far back as four thousand years before Christ, the art of embalming their dead was practiced by these people, the bodies of Cheops and Mycerinus and others of the age of the fourth dynasty having been subjected to embalming processes. The embalming of the body of the patriarch Jacob is one of the earliest recorded instances of the preservation of the human corpse on record, and the body of Joseph was thus prepared and transported out of Egypt. Three separate and distinct methods seem to have been employed, one for the rich, one for those with moderate means, and the third for the poor, thus showing that their knowledge of chemicals and their therapeutic action was not confined to any one substance. After removing the brain, the body of the wealthy was prepared by "passing peculiar drugs through the nostrils into the cavities of the skull, rinsing the belly with palm wine, and filling it with resins, cassia, and other substances." It was then steeped for seventy days in natron, which they obtained from margins of lakes by evaporation, and from the dried-up water courses of Egypt. Natron, we find, is an impure sesquicarbonate of soda, and always contains sulphate of soda and chlorid of sodium. This substance either brought away or destroyed the viscera and soft portions, leaving only the cuticle and bones. The second process consisted of removing the brain, as in the first instance, but only injecting the viscera with kedron or cedar oil and soaking the corpse in a solution of natron for seventy days. The dead bodies of the poor were washed in myrrh and simply salted for a period of seventy days. Other nations employed different means, but seem to have been less successful. The Persians employed wax; the Assyrians honey; the Jews embalmed the monarchs with spices, the body of Our Lord being anointed with them according to their method of embalming. This art never was lost in Europe, several methods being recorded, but no essential chemical discovery for this purpose seems to have been made until the preservative property of mercuric chlorid was made known by Chaussier, in the seventeenth century. Later, in 1834, Grannal announced his discovery of the preservative power of a mixture of equal parts of acetate and chlorid of alumina. The properties of arsenic and pyroxilic spirit and the antiseptic nature of zinc chlorid were made known by Babbington and Rees in 1839.

Acetate of alumina is prepared by dissolving lead acetate and common alum in hot water separately, mixing the two solutions, and filtering off the insoluble lead sulphate which is formed. It is used very largely as a mordant by dyers, causing textiles to hold their color. The chlorid is obtained by heating a mixture of alumina and charcoal in a current of chlorin gas, and is used in the manufacture of the metal. Common alums are the most useful compounds of alumina, and are a series of double salts which aluminum sulphate forms with the alkaline sulphates. Alumen exsiccatum, with equal parts of zinc oxid and thymol, with glycerol and oil cassia q. s. to form a paste, is being used largely for the purpose of mummifying dental pulps. This process is called "foolishness" by some and a "godsend" by others. Isn't it logical to say that if the Egyptians could preserve dead bodies containing the viscera by the application of palm wine, resins, cassia, etc., that we to-day can embalm the pulp with alumen, thymol, zinc oxid and cassia? Is the latter process to be considered impossible simply because it happens to be diametrically opposed to our former teachings that a dead pulp left in a tooth would putresce, mephitic gases be formed, setting up irritation that would be followed by inflammation and suppuration? Let us not be so fogy as to characterize this sort of treatment as foolishness and go to the extreme of asking our dental journal editors (as one man did recently) to keep all such "foolish" talk out of our periodicals. It is not foolishness, as he would have you believe, but it is the practical application of chemical knowledge obtained by experimentation.

The Egyptians also fixed colors in silk by means of mordants, prepared many medicines and pigments, also soap, beer, vinegar, metals, and metallic alloys, sodium, chlorid, vitriol, soda, sal ammoniac, glass, enamel, tiles, and painted earthenware. The Chinese also were very early acquainted with the process of dyeing and the preparation of metallic alloys. They were capable also of manufacturing nitre sulphur, gunpowder, borax, alum, porcelain, verdigris, paper, etc. The Greeks and Romans derived what chemical knowledge they possessed from the Egyptians, but added little or nothing to what was known already. The advancement of all science in Europe was stopped at the time of the overthrow of the Roman Empire.

Before the eighth century the study of chemistry was taken up

by the Arabs, and researches were made by their scholars, the alchemists, and by them was introduced into Spain, afterward being carried into other countries of Europe, where it "became speedily entangled with the fantastic subtleties of the scholastic philosophy." While they had many excusable errors in theory, the Arabs "were genuine practical chemists." They toiled at the art of making many medicines out of the various mixtures, and reactions of such chemicals as they knew. While they had their "mortars and pestles, their alembics and aludels, their vessels for infusion, for decoction, for cohabitation, for sublimation, for fixation, lixiviation, filtration, coagulation, etc., they labored with them, not with a view to discovering chemical properties of substances, but only with the hope of obtaining two great results—first, the secret of transmuting the baser metals into gold and silver, and, second, the means of indefinitely prolonging human life." It is to them, however, that we are indebted for our first work on this school, known as the *Summa Perfectionis*, composed by Cibber in the eighth century, and consequently is the oldest book on chemistry proper in the world. It is said to contain so much of what would sound to us like jargon, that Dr. Johnson ascribes the name of the word "gibberish" to the name of the compiler; and yet, "viewed in its own true light, it is a wonderful performance."

The term "amalgam" was first used by Thomas Aquinas in the twelfth century. Albertus Magnus during the same period introduced the use of symbols, and was very enthusiastic about the then new process of distilling spirits, declaring the spirit of wine to be the "very elixir of life." Basil Valentine, whose practical knowledge of chemistry was great, and who knew how to precipitate iron from solution, as well as many similar processes, ranks as the founder of analytical chemistry. He introduced antimony into medical use about 1394.

While the labors of these alchemists have seemed to be but the "chasing of a will o' the wisp," and without any tangible results, there were some who were really meritorious, and to these we must give the credit of paving the way for genuine chemistry. It is interesting to observe that "the leading tenet in the alchemist's creed—the doctrine of the transmutability of other metals into gold and silver, a doctrine which it was thought at one time modern chemistry had exploded—receives not a little countenance from a

variety of facts every day coming to light. The multitude of phenomena, known to chemists under the name of allotropy,"—that is, the variation in physical properties shown by elements or their compounds without change of chemical composition,—"are leading a speculative man more and more to the opinion that many substances hitherto considered chemically distinct are only the same substances under different conditions, or arrangement of their component molecules, and the number of really distinct elements may be few indeed."

The first germs of a real science of chemistry appear about the end of the seventeenth and beginning of the eighteenth century, when Beecher, who "possessed an extensive knowledge of medicine, physics, and chemistry," promulgated the first theory of chemistry. He it was who first attempted to bring physics and chemistry into close relation, and sought to find the cause of all the inorganic phenomena in the world. By his investigations of the process of combustion, he enabled Stahl to announce his phlogistic theory some time later, which theory obtained universal acceptation until refuted and overthrown by Lavoisier. During the seventeenth century the science began to advance rapidly, and many important laws of chemistry were discovered. Geoffrey announced the first tables of affinities in 1718; Boerhaave published many original experiments on the chemical relations of heat and light in 1732; in 1724 and 1726, Hales and Black published, respectively, their researches on the air and aeriform bodies, differentiating carbonic acid evolved during fermentation, respiration, and by the action of acids on chalk, from atmospheric air. Alumina and magnesia were added to the then known earths, lime and silica, by Margraff in 1754-59, who also extracted sugar from plants. It was in 1770 that Priestley began making announcements of his discovery of oxygen, ammonical, hydrochloric, and sulphurous acid gases, etc.; and in 1773 to 1786, Scheele contributed chlorin, hydrofluoric, prussic, tartaric, and gallic acid, also baryta, phosphoric acid obtained from bones, and gave out the first hint regarding a new doctrine of combustion. About this time Bergman and Cavendish made additional contributions to the knowledge of gases. Between 1770 and 1794, Lavoisier reorganized much of the then known chemistry, "and founded a system of chemistry which to-day remains as the framework of the science." Berthollet, in 1787, contributed much

to the doctrine of affinity, and made researches in chlorin. Organic chemistry was advanced by Fourcroy and Vanquelin, and many contributions were given to mineral chemistry by Klaproth. Richter devoted himself to the doctrine of combining proportions, the atomic theory being afterward perfected by Dalton. Sir Humphrey Davy, and others, were led to make important researches in the metals and gases by the discovery of galvanic electricity by Galvani, and its further advancement by Volta. The knowledge of organic substances and of chemical relations of heat was broadened by the work of Gay Lussac and Thenard, and Berzelius by his laborious researches in mineral chemistry "gave an exactness to this department which is an astonishment to the chemists of the present day." He was also the author of the electrochemical theory, which has later been almost perfected by the labors of Faraday and others. In more recent years, organic chemistry has been very much advanced, and most rapidly too, through the labors of such men as Liebig, Whohler, Mulder, Laurent, until to-day we have a science which seems so nearly perfect that we may feel there is nothing within its realms left for us to discover. Let us remember, however, that the summit of perfection was thought to have been reached some twelve hundred years ago. It may be that after all that many important discoveries are yet to be made, and it is for us, as a profession and as individuals, to contribute our share of the brains, coupled with intelligent and well-directed effort, to get out of the science by experiment and research any latent truths that still may be lurking within its mysterious confines.

There have been so many changes and additions in the latest United States Pharmacopœia, that, while they affect the physician and pharmacist more largely, are to a very great extent of interest to the scientific dentist. Permit me, then, to briefly review a few of them.

Because a large number of remedies, synthetic in their nature, having the same chemical identity and therapeutic action, were being marketed under various commercial names, it was thought best to give them official recognition, and names approximating as closely as possible their true chemical name or its synonym. This enables us to know the therapeutic action of these compounds by their chemical formulæ. Those remedies not having a definite chemical composition were given titles in harmony with general

usage, and convenient for prescribing. "Aristol" has been admitted as thymolis iodidum, a name showing that it is an iodin compound of thymol. This method of using the true chemical name has been extended to a large number of preparations already official whenever practicable. "Acidum carbolicum" is no longer approved by these changes in chemical terminology, but we are to use the term "phenol" in its stead. The composition of "salol" is also shown by its new officinal name, "phenylis salicylas." Extracta fluida now becomes Fluidextracta, written as one word.

The old teaching—that *ic* acids make *-ate* salts and *-ous* acids make *ite* salts—has undergone considerable transformation. As an instance of this, cocain hydrochlorate is now called cocain hydrochlorid. Being desirous of learning why these changes in terminology were made, I wrote to Merck & Co. of New York, and quote you their letter bearing upon this subject *verbatim*:—

"As you are doubtless aware, there are two classes of salts, those in which the hydrogen of an acid is replaced by some metal or metallic radical; and secondly, those in which there is direct union between the acid and the base. For instance, in hydrochloric acid, the H may be replaced by, let us say, sodium, when we obtain sodium chlorid, not hydrochlor*ate*. On the other hand, when we combine an alkaloid, let us say quinin, with hydrochloric acid, we get quinin hydrochlor*id*, not hydrochlor*ate*, because this latter term can be considered as applicable only to the compound of quinin with chloric acid. To make the matter clear, it is merely necessary to state that the hydrogen in the $HC^{1}$ as well as the $HC^{10}$ remains, and is not replaced by the quinin radical. The same applies to hydrobromic acid, hydriodic acid, etc. Consequently if we speak of quinin hydrochlorate, etc., we imply a compound of chloric acid, for example, $C_{20}\ H_{24}\ N_2\ O_2\ HC^{10}_{3}$, and not the hydrochlor*id* which has the formula $C_{20}\ H_{24}\ N_2\ O_2\ HC^{1}$. Again, quinin chlorid would have the composition $C_{20}\ H_{24}\ N_2\ O_2\ C^{1}$. Naturally, if the hydrogen remains attached to the quinin, the salt should rationally be considered a hydrochlorid."

There have also been many changes in strengths of certain preparations, which, of course, affect their dosage. This has been for the purpose of making the different heroic remedies of uniform strengths in the pharmacopœas of the different countries. Some have been increased and others diminished. Information regard-

ing the different changes may be had by securing Bulletin No. 23 from the Hygienic Laboratory, Public Health and Marine Hospital Service of the United States, at Washington, D. C.

I shall close this paper with a few practical suggestions on the use of some remedies it has been my pleasure to exhibit, following the recommendation of other practitioners in several instances. In hemorrhages from tooth extraction, from the pulp or gingiva, during the preparation of roots and teeth for crowns, adrenalin chlorid applied on a pledget of cotton usually controls it readily. I never use Monsel's solution, or persulphate of iron, under any circumstances.

A recent writer advocates closing the apical foramen of teeth with a few fibers of cotton moistened with tincture iodin and then dipped in tannin, or tannic acid, as it is more commonly but erroneously called. He claims that the cotton would harden, thereby completely closing the foramen, and that the iodin and tannin would exert beneficial influences on the contents of the dentinal tubuli. In this connection I wish to say, I have found that this combination, on exposure to the air, does harden, and the iodin seems to lose its usual property of corroding steel, but in the light of the following experiment by Magitot, I believe this process should be more closely considered before using it:

"A tooth was placed in a solution of tannin, 1 to 100, the container hermetically sealed, and allowed to remain for two years. At the end of that time the enamel showed to have suffered no ill effects; it kept its polish, but was covered with a light deposit of greenish coloring matter. The cementum, however, 'showed marked softening, was easily penetrated by an excavator,' and assumed a light-brown color." I intended making some experiments to ascertain whether the combined action of iodin and tannin would affect tooth structure with tannin held in solution by tincture of iodin, and also the preparation recommended as before stated, but time forbade any definite conclusions in time for insertion in this paper.

We all have our cases of pyorrhea, and I presume most of us have accepted the uric acid theory as a cause of this disease. In troubles of this kind, after cleansing the teeth thoroughly and washing out pus cavities with hydrogen peroxid, I prescribe as a mouth wash "liquid antisepticus," and giving internally thialion, a teaspoonful in cup of warm water three or four times a day, until catharsis is pro-

duced, then fewer doses per day. Thialion is a laxative salt of lithia, and is very efficacious in all cases of uric acid excess.

Thuja occidentalis has been recommended for the removal of epulidæ before they have reached the sarcomatous form. It is claimed that if the epulis be injected with this preparation two or three times a week it will frequently disappear.

I have tried cataplasma kaolini, a preparation of clay and glycerin, and which is marketed under the names of antiphlogistine, depletant, etc., in cases of incipient abscess, by applying it warm to the cheek of the patient, holding it in position with a surgical bandage. The results have been gratifying. Inflammation is usually reduced in this way and the abscess aborted.

Formalin, which is a forty per cent. solution of formaldehyd, may be used to advantage in treating putrescent pulps, but care should be exercised to prevent its coming in contact with the tissues of the mouth, on account of the intense burning sensation which it produces. You should also refrain from flooding the canals and attempt to dry out same with hot air, as the gas generated will cause considerable discomfort to the patient and yourself by inhalation and its irritating influence on the eyes.

Dr. Dorr presented his method of treating putrescent pulps in the April number of the *Dental Brief* with "solidified" formaldehyd, and, while I have not used this particular method, my experience with formalin leads me to accept his ideas as being perfectly correct. Briefly, his manner of operating is this: Where the pulp has putresced , open up the pulp chamber well, "clean out as much of the debris as possible, syringing frequently with tepid water, care being taken not to enter the canals." After drying the cavity place a small piece of the formaldehyd in the pulp chamber, cover it with a pledget of cotton, and seal same with temporary stopping. Cement should not be used on account of its porosity. It may be necessary to place a particle of the preparation at the opening of each canal in multi-rooted teeth, before placing the final application in the pulp chamber. It may remain in the tooth from twenty-four hours to ten days, according to Dr. Dorr, without injurious effects, and when removed there is no longer any odor of putrescence, and no tenderness is found on percussing. The theory is that "there is enough heat and moisture in the tooth to liberate formaldehyd gas, which is forced into the pulp canals, thoroughly sterilizing all

of the dead pulp tissue, together with the walls of the canals to the very apices, thereby eliminating all danger of infection of the regions beyond."

A physician in my town recently called my attention to the happy results he had obtained from the action of chloral hydrate for relief of pain after extraction of a tooth by placing it in the dental socket. This action of chloral, or its hydrate, is probably due to the fact that it is decomposed by weak alkalies into chloroform and potassium formate. Normal blood being alkaline, as is normal saliva, we can see why and how this reaction may occur.

I do not believe we dentists, as a rule, give enough attention to the diagnostic value of the study and examination of the oral secretions of our patients. Under the influence of pathological conditions during the continuance of general acute affections of the body, it has been shown by Magitot that immediate phenomena are produced by reflex action, upon the mouth, which are more or less complete suppression of the salivary liquids, while there is at the same time an increased amount of mucus. The condition of the saliva is, in a very large measure, responsible for the condition of the teeth. I have just said that normal saliva is alkaline, but I do not mean to convey the idea that its reaction should show a super-alkaline condition.—*Items of Interest.*

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GROUND PORCELAIN CORNERS WITH MECHANICAL ANCHORAGE. By P. B. McCullough, D.D.S., Philadelphia, Pa. The prepared shape of the cavity is that indicated by the lines of decay or fracture. It may form two plane surfaces with one angle (Fig. 1), or one of two other forms, each with a plane surface. For a corner with one angle, the vertical plane forms an obtuse angle with the base, thus making two flat surfaces to be fitted. The vertical plane, A, may be formed rapidly with abrasive paper disks, and the surface made flat by means of the side of a vulcarbo disk and a Murphy file. The cervical plane, B, is finished with the edge of an abrasive disk and a narrow file. Any make of detached pin crown best suited in mold and shade is selected and ground to fit the space.

The section to be used is outlined with a corundum disk and broken off. The vertical plane surface is first ground to size, then the cervical end is ground to proper length, when both surfaces are

trued on the side of a fine stone on the lathe. (Fig. 2.) Throughout, care must be observed not to chip the edge.

A cavity is cut in the tooth shallow at the cervical angle with a flat base and pointing to the incisal edge (Fig. 1), where it becomes deepest, forming the only undercut, so that the matrix is drawn

FIG. 1.

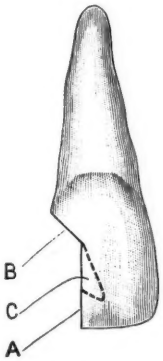
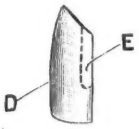



FIG. 2.




by turning out from the cervical end or angle. In this cavity is adapted 2-1000 platinum. Should the puncture be a considerable one, a second smaller matrix may be shaped over the puncture and adapted with wet spunk, which is left in place until invested. The matrix is filled flush with any filling gold packed lightly, and 22-k.

FIG. 3.


FIG. 4.

solder flowed through. This inlay, returned to the cavity, is ground flush with the edge of the latter, taking care not to injure the enamel.

The porcelain section is grooved vertically with a diamond disk, as a starter only; then a piece of clasp-gold wire, F, of about No. 18 gauge, is held in a screw chuck sold for the engine (Fig. 3), and

with this wire used like a drill, the groove is cut from the cervical plane surface, using carborundum powder in glycerin as the abrasive. This hole (Fig. 2, E) is so formed that while it is open on the vertical plane surface where the wire is exposed it can be withdrawn only from the end by which it enters. This wire is cut off flush with the base of the inlay, and if necessary its exposed side is ground flush with the flat porcelain surface.

With the wire point in the porcelain, and the gold inlay in the tooth, the porcelain is rubbed to and fro on the tooth with wet pumice to finish the joint. Having the mouth napkined, the sections washed and dried, and the inlay for the tooth in place, the wire point, in the porcelain and warmed, is touched with the faintest particle of hard wax, a blast of hot air is directed on the gold inlay,

FIG. 5.

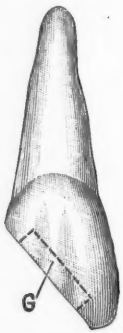



FIG. 6.

and the porcelain is pressed to place. With the withdrawal of pressure the porcelain drops off, leaving adherent the gold sections, which are then removed, invested, and a particle of low-karat solder placed at a convenient spot to unite the sections. (Fig. 4.) With one mix of cement the gold is first placed, then the corner slid to place and held.

If the decay is such that after the vertical plane at the labial surface has been finished there still remains the unprepared edge of the cavity more extensive on the palatal surface, then this part is prepared independent of the labial plane and the matrix adapted over the edge and filled with the melted gold, so that when returned to the cavity the exposed surface is cut flat and flush with the labial enamel edge. By this means the joint with the porcelain on

the palatal surface is made with the gold, thus obtaining a plane surface without cutting away labial enamel, which it may be desirable to retain.

When the case presented admits of being ground to a plane surface the operation is made much easier. With the finished plane surface extending from a point at the incisal edge to the gum margin (Fig. 5), a cavity is cut of uniform depth and with a flat seat, G, and, as above recommended, a gold inlay is made. After the porcelain has been ground to fit, a small round clasp-gold disk is made of about No. 2 gauge, which is held on a screw-disk mandrel (Fig. 6), and the gold used with carborundum powder to cut a semicircular groove in the porcelain. (Fig. 7, H.) When this groove is cut as deep as the mandrel will allow the disk to go, the disk is cut in halves, one piece filed flush with the ground surface of the porcelain, and, as in the first case, waxed to the inlay in the tooth, removed, invested and soldered. (Fig. 8.)

It will be seen that in this class of cases a very delicate tapered

FIG. 7. FIG. 8


point of porcelain remains at the joint with the tooth at the incisal edge, supported only by cement—which is no support; therefore, since it cannot be expected that this point will last without protection, the following method is offered as being used always with this as well as with the class first described.

After the gold section has been placed with cement and the porcelain is in position ready to press to place, a piece of No. 60 gold foil or a gold roll is inserted in the joint to about one-sixteenth of an inch, then the porcelain is pressed home and held until the cement has set. There being free escape for the cement throughout the joint, and it being least confined at the incisal edge, it will be seen that under pressure the cement is practically eliminated at this point, leaving the gold as a permanent support. (Fig. 9, I.)

That this gold cannot be seen may be believed when the thickness of No. 60 foil, as seen looking at its edge, is considered.

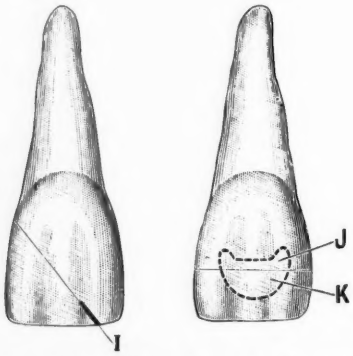
When the restoration is one where the entire incisal edge is gone,

no change in the technique is indicated. The cavity in the tooth is prepared for the inlay (Fig. 10 J), and the porcelain cut with the gold disk, one half of which, K, is soldered to the inlay, J. Of course, in this class of cases the gold protection for the porcelain is not required.

The head of the mandrel, as well as the head of the screw carrying the circular gold disk to grind the cavity in the porcelain, is cut down, so that without the heads the disk may penetrate deeper in the porcelain.

Each of these cases presupposes vital teeth; in the first two, if

FIG. 9. FIG. 10.




devitalized, instead of avoiding the pulp by cutting toward the incisal edge, anchorage would be obtained by inserting a cone-shaped tube in the canal, filling it with melted gold and proceeding as above recommended.

The increased strength obtained by this method, using the first case described as a basis of measurement for comparison with the methods usually practiced, is shown by consideration of the following features: The inlay fitting the cavity in the tooth is so shaped that it can be dislodged only by turning it out and down from the cervical end. When the wire fitting the porcelain is soldered to the inlay, the former can be detached only by drawing down; thus every possible direction of the application of force is resisted mechanically by the gold bridging the joint, the cement serving to keep the corner from falling in the direction in which no force is applied.—*Dental Cosmos.*

## THE ETIOLOGY OF THE DESTRUCTION OF THE ALVEOLAR PROCESSES AND THE CONSEQUENT LOSS OF THE TEETH.

By Dr. Edward Eggleston, Richmond, Va. The popular conception of the nature of the diseases which cause the impairment and ultimate loss of the dentition is almost entirely erroneous, in that this conception generally treats what is known as Riggs' Disease or pyorrhea alveolaris as a local affection, or, I might say, infection, to be dealt with locally, and even essays in some instances to cure the trouble by local medication, assisted by such surgical or mechanical means as the careful removal of calcareous deposits, etc. This condition I now conceive to be due to constitutional causes. I do not recall a single case in which the trouble originated from purely local causes, in the mouth of a healthy individual.

What are these causes? There is a growing tendency among those practitioners who are getting out of the rut to ascribe the blame to uric acid, and in this conception they are partially, and only partially, correct. Entirely too many human ailments have been ascribed to uric acid. Nine-tenths of these troubles, I am satisfied, are due to constitutional causes other than uric acid in excessive quantities, although I consider that about one-tenth of these cases is due to this form of derangement.

Broadly, then, I will say that the condition in question is the result of a failure on the part of one or more of the vital organs to perform properly its function, or their functions, as the case may be, and thus the tone of the whole organism is lowered, causing local capillary disturbance and consequent congestion, inflammation and suppuration of the soft tissues, including the cellular bony supports of the teeth.

The heterogeneity of the human organism is wonderful, and all the details of variation from normal performance of function are not fully understood by the greatest of physiologists and pathologists, as they will generally confess; but the general cause may be stated as follows, some functional disturbance of the liver, kidneys, heart, or lungs.

The imperfect performance of function by any one of these vital organs immediately lowers the vital tone of all the tissues of the body, and this condition is followed by an imperfect elimination of waste products. Then we have, floating in the circulation, more

or less poisonous matter, which causes the greatest irritation in the capillaries and consequent congestion in those localities where capillaries are numerous. It is thus the gums become perhaps the most common seat of this local congestion.

There are two distinct ways in which this congested condition may do the damage. The irritation may cause the absorption, or resorption, of alveoli, just as the irritation of the impingement of the advancing permanent teeth causes the absorption of the roots of the temporary teeth, or the destructive process may advance by the familiar stages of irritation, inflammation and suppuration of all the tissues that contribute to the support of the teeth.

I could relate from memory the history of the development of these local destructive processes, which so sorely afflict the human race; I could show you cases resulting from various forms of liver trouble, and others the direct result of kidney trouble, and again, cases having their origin primarily in heart disease, etc.; but of course the vast majority of these cases are the result of a complication of disturbance of the function of more than one of these organs, as any serious disturbance of any of the four great vital organs of the body which I have mentioned very soon entails more or less trouble with some other. This fact is more particularly true of the liver and kidneys. Any serious liver trouble is almost sure to cause more or less complication of kidney trouble, etc.

For my own part, I am entirely satisfied with the correctness of my position, as outlined; but to those who think differently, I would offer, as a testimonial to the accuracy of these observations, the fact that the much-talked-of irritation of calcareous deposits is entirely absent so frequently in these cases.

You will recall that many of these teeth come away with roots sleek, and some even with a polished appearance. This fact is in itself a contradiction to the theory of the irritation of these deposits as the principal cause of recession of gums and absorption of alveoli.

Furthermore, I am persuaded, and to my own mind have abundant proof that deposits under the gums of a dark-brown hue, and variously described by dental writers as sanguinary, crescent, etc., are entirely distinct from salivary deposits, and not the primary irritant and cause of this trouble, but an after-effect.

The violent congestion of the peridental membrane results in the

exudation of the blood and the breaking away simultaneously of a certain part of the peridental membrane. Upon the surfaces thus exposed, these deposits are found after the damage is done. I do not mean to say that this deposit does not act as a secondary irritation and aggravate the troubles already present; but this deposit is never the primary cause of gum troubles, as many believe.

This condition is the most important which we have to contend with, as it has not been entirely subjugated, as has caries, to the skill of the operator, and as the destruction of the dentition is more rapid and more certain when left without treatment than is caries.

As to the possibilities of regulating this trouble, I contend that if it comes to us in time we can prevent the loss of the teeth and preserve them in usefulness, comfort and appearance, permanently, from the ravages of these local conditions.

*Do not understand me as claiming that I can cure this disease, for I am talking only about the local treatment of one of the manifestations of a constitutional derangement.*

The treatment of this trouble should begin with some education of the patients in the matter of diet. They should be taught to eat those foods which are least injurious in this particular kind of trouble, and at the same time not to deny themselves proper nourishment, either by too rigid a limitation of variety or by too small a quantity.

Of course, this dietary regulation should be preceded by an exhaustive physical examination; but this cannot always be had, as few doctors are in the habit of doing this, and patients are reluctant to seek it. Following this examination and regulation of diet, nature should be assisted by the discriminate use of drugs, constitutionally administered. To this proper exercise should be added, and this will depend entirely on the nature of the disorder and the constitutional tendencies of the individual.

The best results are to be had by a thorough consideration of the general practitioner with the dental specialist, and in this connection it is greatly to be desired that dentistry be elevated so as to place the operator on a plane of perfect professional equality with the general practitioner of medicine and surgery.

However, until dentistry is elevated to the standard of a specialty of general medicine and surgery, we would do well to read broadly

and keep so informed as to give our patients such constitutional treatment as is indicated when we cannot command the full confidence of the general practitioner into whose hands the patients would fall, or when we have not confidence in the ability of the family physician.

As regards local treatment, in all cases, no matter what the cause may be, we should proceed forthwith to relieve the local congestion, when such congestion exists, by such means as free blood-letting, the use of compressed air atomizers, vigorous brushing with stiff brushes, and a massage by means of the thumb and forefinger, first by the operator himself, and after the treatments have ended, by the patient.

One of the best hygienic lessons to teach the patient in these cases is to take an antiseptic fluid into the mouth and force it back and forth between the teeth, by the use of the muscles of the cheeks.

In case of irritated and suppurating surfaces, such parts should be cauterized with trichloracetic acid, 50 per cent., at intervals of a week, until a normal condition is restored, or approximately as nearly as possible. I cannot lay too much stress on the frequent use of antiseptic fluids with a high pressure atomizer, and this part of the treatment cannot be carried to excess.

Now comes what I may term the heroic treatment, and it is by far the most essential part of the preservative means at our command. I do not advise this heroic treatment in all cases. If they come to us when the trouble first manifests itself, the heroic treatment is not necessary, but frequently when the patients come many of the teeth are loose and often some are already gone.

In these cases, the pulps of all teeth should be removed. Do not try to compromise with the trouble by removing the pulps only of the very loose teeth. If you do, the teeth that are still firm in all probability will become loose. The unaffected teeth are needed to support those already in trouble, and if you remove the pulps of the loose teeth only and attach them to support each other, you have burnt the bridge behind you and rendered far more difficult a complete operation, which will be indispensable if the dentition is to be permanently preserved.

In this situation we are confronted with a desperate condition, and heroic means are clearly indicated, so I recommend to you the complete and thorough removal of all the teeth pulps. This

operation alone is of the greatest benefit to the teeth, when those tissues which afford them support have become destroyed or damaged to any considerable extent.

The next step in this practice is to support mechanically every tooth left in the mouth and from which the pulp has been removed, and in doing this the pulp chambers are used to carry the support. It is possible by this means practically to conceal the fact that any operation whatever has been performed, and in addition to restoring the teeth to usefulness, the highest possible esthetic effect is obtained.

This support is made in many sections of several different metals, including gold, platinum and iridio-platinum, and finally the entire support, when placed in position in a single piece, holds every tooth in the arch, in an absolutely firm and immovable position.

I do not wish to claim too much for this treatment of what is commonly and erroneously known as pyorrhea alveolaris, and yet I look upon the series of operations and medications, which I have reviewed in your hearing, as productive of permanent results, so far as any dental operation can be considered permanent.

I never yet have lost the teeth in any case so treated, and some of them have been standing more than ten years.—*Dental Summary.*

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THE SELECTION OF FILLING MATERIAL FOR ORAL PROPHYLAXIS. By Dr. E. J. Lewis, Denver, Colo. From ideas I have heard expressed and from the examination of various mouths, I am led to believe that too much attention has been paid to the filling we would like to insert, instead of carefully studying certain characteristics of our patients, the position of cavities and the probable cause. An operator may become convinced that gold, amalgam, porcelain or cement is the only filling material practical and serviceable, but any conservative man will agree that such a conviction is misleading and detrimental to the high degree of perfection we would obtain and presents a disappointment in the final results in the treatment of dental caries.

We should note carefully the condition of the patient's mouth as presented, and if we find that no care is taken of the teeth, a material that is easily manipulated and inexpensive might be chosen, since it is not likely that gold or porcelain would remain any longer

than the poorest material, under these unfavorable conditions. These principles are not to be practiced in every case, but what I have said is worthy of the consideration of a dentist who cares to retain the following of this class of patients.

If reasonable care is taken of the teeth, under favorable circumstances, almost any material may be inserted with a feeling of certainty that it will last as long as that individual filling material is expected to last. A thorough examination of the location of certain caries to be found in the oral cavity, will convince a reasonable operator that gold is not the material to be inserted, for no one is so proficient that he can (in certain known locations) manipulate gold with the same degree of perfection as amalgam. Therefore, if you are not sure of your ability, use a material which can be perfectly inserted in this adverse locality. It is to be remembered that what is difficult for one man is perfectly easy for another. Since this is true, it is the duty of every dentist to learn just what he can do, and under what circumstances it is possible for him to insert one material or another.

There often is a period in young people's lives when decay is so extensive that it requires the tongue of an orator to convince them that this condition may be checked and that such a period may never recur again. When such a condition is present it has been my practice to fill the cavities with cement, which can be done with comparatively little expense to the patient. This cement, if properly inserted, will last a year and possibly longer, and from the closest observation I am led to believe that there is no material, which will not discolor, that will render a cavity so immune from decay. As far as adaptation is concerned, cement certainly has no superior. It seems to become as nearly as possible a part of the tooth structure itself, and later, when the filling becomes disintegrated, if the conditions have been improved, any filling material you choose may be inserted with at least a degree of certainty that it will be permanent. However, if conditions do not warrant the placing of a permanent material, I would advise filling again with cement. To some, all this may seem useless, but in the end you will obtain the best results and gain the everlasting confidence of your patients.

In all labial cavities, where access can be obtained, I know no reason why porcelain inlays may not be inserted, since they are more

permanent (when properly adapted) than cement, and serve practically the same purpose. Just at this time I am not enthusiastic over porcelain; nevertheless it certainly has its place; a great mistake would be made not to use it.

As it is well known and generally conceded, the quick setting amalgams do more for the prevention of decay than any other single material. When the selection of a filling material for any of the posterior teeth becomes a close question, it is generally well to be on the safe side and choose an amalgam. Where we find large cavities extending beyond the gingival line of the molars, amalgams are almost specific. Sometimes we find cavities so large that it is not advisable to place gold, and yet a crown is not indicated; in such cases, a well-contoured amalgam may last for years. Some patients are too nervous to tolerate the blow of the mallet, which is generally used in placing a gold filling. Even though hand pressure is used, the polishing would be more than they could endure. In such cases it is often advisable to use an amalgam in preference to any other material. There are other cases where amalgam best preserves the teeth, but those mentioned are the most important.

Gold is certainly the most perfect filling material we have, but like all the rest, must be indicated before perfect results can be obtained. When indicated, if it is manipulated by a competent operator, we have a filling which has no superior. Of course the color is not desirable in the anterior teeth, but that point is not to be considered in this paper, since we are now only discussing the selection of filling material for oral prophylaxis. Whenever it is possible to do so, all of the posterior teeth should be filled with gold. Since I am so sure of this, I will add that every man should decide whether he can properly place a gold filling in a certain cavity or not, and if he is sure he can, let him do so, for if properly inserted, the chances are that it will be the best for the preservation of the tooth.—*Items of Interest.*

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CEMENTED INLAYS OR CONTACT FILLINGS—WHICH? By Clarence J. Grieves, D.D.S., Baltimore, Md. Every art in its genesis develops certain basal axioms, which, applied under like conditions, always produce like results, otherwise it is not worthy

the name. Later, reasons are found, laws are proven, and the art inductively becomes a science.

Antedating by centuries, the sciences of dental bacteriology, pathology and therapeutics, the merely mechanical closing of a carious tooth cavity against recurrence had for its axiom, second only in importance to the removal of decay, the sealing of the cavity edges so as to prevent the ingress of saliva.

That we still apply, or attempt to apply, this rule proves that it has the sanction of our science, that it is more true to-day than ever, and that just in so much as the individual operator, armed with an exact knowledge of dental pathology, accomplishes the preparation and sealing of cavity edges by adaptation of metals, will he succeed in tooth salvation.

So great, however, has been the percentage of failure in a science the practice of which is second, bar none, in handicraft, that it would appear not amiss in these rather too smug later days to look again into the simplest physical facts relative to the process of filling a tooth and to our armamentaria, and to question not this ancient axiom, but the possibility of its accomplishment by the mere mechanical application of metals.

The physical forces, acting for or against the adaptation of solids, are cohesion and adhesion, and where fluids are concerned that subtle resultant of these, capillary attraction. Cohesion is the physical force operating at finite, but insensible distances which holds like molecules; and adhesion, unlike molecules, together; so, if solids be separate they cannot be made to adhere because it is impossible to get them close enough. The adhesives, such as mortar, glue, cement, etc., and the attraction existing between clear, fresh surfaces of gold, tin and lead when brought into forcible cohesion are notable exceptions to these rules. All solution is due to adhesion. Sugar dissolves in water because the water molecules have a greater affinity for the sugar molecules than the sugar molecules have for each other; water is among the most adhesive of all substances.

Capillary attraction is but an expression of adhesion and cohesion, due to a fluid; water will rise to a height of four inches in an open tube one-hundredth of an inch in diameter, if the tube be closed it will rise as far as the contained air will allow; the water adheres to or wets the tube walls; its surface is concave, rising higher as it

nears these from surface tension. Mercury will remain depressed about a glass tube because of a lack of adhesion, but if a tin tube or a bar of lead be used, it may be siphoned from the containing vessel; capillarity acts inversely, the more narrow the chink the greater the force.

There is no apology offered for these elementary, but important physics; when we realize that the mouth and what it contains are wet, that no capillary opening can exist unless it fill instantly to the extent the enclosed air will allow, and that any joint between tooth wall and filling short of perfect adhesion will leave the cavity almost, if not quite, as wet as it was before the operation.

We know, by a previously quoted law of physics, that it is quite impossible to bring the surfaces of solids having a different molecular arrangement, as gold and tooth wall into such perfect apposition as to make them adhere, and it would be a bold physicist indeed who would claim every hour in the working day to arrange joints at such finite, but insensible distances as to overcome capillary attraction without some adhesive media or cement, particularly in a cavity as inaccessible as the human mouth. Yet that is precisely the claim of the modern dentist.

Turning to the filling materials now in use and their physical characteristics, we find gold, cohesive and noncohesive, often associated with platinum; tin alone or combined with gold; amalgam alloys (usually Ag75-S25, sometimes adding 5% Au, Cu, Zn, or Pt), made soluble by mercury; vegetable guttapercha stiffened with metallic oxids and cement used alone, under other fillings, or as a retention for gold and porcelain inlays. None of these adhere to the tooth wall save cement.

Cohesive gold, if accurately placed, "stays put" with active cohesion between its molecules; noncohesive gold, as its name implies, lacks cohesion. This is a most valuable quality; rightly worked it produces the most perfect contact short of adhesion known to dentistry by the passing of its folds under wedging pressure. To quote an authority, "It closes the cavity as cork does a champagne bottle." Tin combines the value of gold, but is soft and better when associated with it than by electrolysis; it hardens, swells and deposits preservative salts. All amalgams, except copper, according to the exhaustive tests of G. V. Black, expand or contract, and what is far worse, "flow"—or give under stress—indefinitely, allowing leakage

and discoloration, due to silver salts. Guttapercha is subject to surface, leathery decomposition, and when wet swells, filling the cavity like cork.

Cements, oxyphosphate and oxychlorid of zinc and derivatives, both of the hydraulic and nonhydraulic type, are, and have been, the only adhesive media used by the dentist; so exacting are the requirements for a perfect cement in the oral cavity that it is yet to be produced. Reference need be made only to the very exhaustive physical tests of Head and the microscopic work of Poundstone, which show in every cement made on test out of the mouth with watereosin complete penetration, either through the cement substance or between such and the ground cover glass to which it was attached, in from two to twenty-four days. Webster and Head have established beyond doubt the penetration by bacteria of cement; the latter proving that the germs filtered through hollow cement shells used in the tests, but were isolated from their habitat and thus rendered innocuous.

The solubility of cements in the mouth is all-important and varies with the product and its manipulation; under the most favorable conditions all are soluble, and to a greater extent in entire fillings than in cemented joints. The doubtful but only guide as to the cemented joint of the future in inlays is the examination of freshly extracted specimens of cemented crowns and inlays. The writer has carefully examined considerably over one hundred, mostly crowns, and found the rule "cement washes out of a joint to the depth of the width of that joint," a fairly accurate statement, particularly when the joint is exposed to the pumping power of mastication. These joints and the pores of the cement completing them, plug with insoluble mucus when sheltered from the laving churn of mastication, thus preventing solution. It must be remembered in this connection that the worst joint in an inlay is far better than the best joint in a crown, but that the crown joint is protected from the bite by crown contour or overhang.

Prior to and during the same period the writer has examined for leakage quite as many, if not more, fresh specimens of all types of contact fillings, especially cohesive gold contours. Only the very best operations were examined, and there was not one but that showed some penetration by saliva, yet very few were found with perceptible recurrent caries. It has been said that this intercaval moisture

arose from the normal tubuli contents. This is obviously an error, first from the desiccation necessary to properly place such a filling, and second, the tubuli contents disappear in a well-marked zone about a filling, or are not infrequently "filled by a healthy secondary deposit."—(Boedecker).

So it is the writer's firm conviction that there is yet to be made, by any mechanical method such as is in use to-day, a joint between gold or any other filling material, except cement and tooth, which will not leak so as to be easily perceptible with a low power. It is not necessarily corollary that because of minute leakage decay should follow; such only occurs under the most favorable culture conditions. Many mouth bacteria have never been cultivated, so delicate are they. Every practitioner has removed many gold fillings, leaking saliva discolored from sulphids, without discerning the slightest softening or symptoms of caries, and considering the old methods of operating it is unquestionably true that millions of teeth have been preserved by leaking fillings. It is equally true that no one can say, except approximately, why caries did not recur under such fillings; if any better method present, no conservative operator will accept the element of chance here involved, for it can have no place in any scientific procedure; and it must not be presumed that the foregoing facts can be used as an excuse for slovenly operating. Aside from the danger of recurring decay, a leaking filling is a filthy thing, unfit for any mouth.

In this connection it may prove interesting to look into the buccal mucus and its role in relation to the protection of fillings. Miller has made plain the fact that the buccal mucus, which is identical with that secreted by the submaxillaries and sublinguals, is a clear, slimy, viscous fluid alkaline, but subject to the state of the health; albuminoid, and hence a nutrient media for bacteria, mixes with the water of the saliva without being dissolved existing independently therein in ropes, is equally insoluble in alcohol, ether, chloroform and dilute acids, but soluble in dilute alkalies and excess acids.

All surfaces, joints and grooves in the mouth, save those cleaned by mastication, are perpetually covered and filled when normal by a layer of alkaline mucus. While mucus is an albuminoid nutrient of bacteria, peptonization of albuminoids has no part in the beginnings of caries, which are dependent entirely on the carbohydrates as nutria and the lactic acid produced by the organisms they nourish

for the disintegration of enamel. The further fact that it is not soluble in water or dilute acids establishes the buccal mucus as nature's own protection for the teeth, as it is for other surfaces in the human body.

So the operator of yore, who, with diligence, elbow grease and wedging produced with non-cohesive gold the very best adaptation possible to any metal before or since with a four-walled cavity, still left some chinks unfilled; these flooded with saliva at once, but soon plugged with insoluble mucus. Those caries-producing bacteria which entered while of an aerobic type here very shortly were isolated from the carbohydrate habitat necessary to lactic acid fermentation, and thus became inactive.

Miller makes this particularly clear in his reference to "the total absence of decay in a closed root-canal which for years had been harboring a putrid pulp and innumerable bacteria;" "for," he says, "in the first place the bacteria in closed canal either perish, or what happens more rarely, become inactive as soon as the nutriment in the pulp is consumed, *i. e.*, in about five days. In the second place, even though they really vegetate for years in a root-canal, we still should have no reason to expect decay because the carbohydrates essential to the formation of acids are wanting. The reaction from a putrid pulp is invariably alkaline."

It must be understood that this cavity was cleansed of decay, being virtually a case of pulp capping; the reaction from caries is always acid, and it is not too rudimentary to say here that no compromise is possible in the removal of decay.

It is thus safe to say that all fillings, including cement, which is adhesive, are penetrated at some point by bacteria, and at best can act only as filters, having the best contact or adhesion and resistance to the stress of the bite, being the best filter to the protection of the caval surfaces, and hence the best filling.

The surface pores of a good cement filling adherent to the tooth wall become saturated with mucus, making the best of filters. The reason such fillings fail first cervically is found in the fact that it is not possible to retain extension of contour as in the inlay, where the joint is projected cervically, and owing to morsal stress the filling wastes in contour, forming a retention center; lactic acid fermentation produces the cervical solution.

The apparently paradoxical statement of G. V. Black, who in his

careful physical investigations of gold fillings as to recurrence of caries found that it was not the cohesive contour having the greatest density or specific gravity which prevented decay, but frequently a pitted, porous filling successful by something in its manipulation, is quite clear when seen in the light of the study of cavity edges after complete malleted cohesive operations, which too often show enamel wreckage quite microscopic. Caries is microscopic, but for its propagation demands microscopic conditions and foci; it is prevented by that method which with the greatest ease produces microscopic barriers against the introduction of its pabulum. Water can be cleansed of pathogenic bacteria by filtration. Numbers count in bacteriology as elsewhere, as witness the statement of Boedecker, who says: "According to the number of microörganisms invading the tissues, the decay is either rapid or slow; in the latter instance a spontaneous healing by reformation of hard tissues is possible."

The successful but porous pitted filling leaked bacteria, but not in numbers, and by filtering produced isolation from the habitat, giving the dentinal tissues a chance for defense or recovery.

It is significant in this connection that after many years of discussion, still continued, as to the relative merits of the two forms of gold, such successful exponents of the cohesive contour extended to prevent, as the G. V. Black Dental club, acknowledged as the largest aggregation of the best operators in this country, practically build the upper two-thirds of such beautiful contours with non-cohesive gold for more perfect contact, finishing by interdigitation with cohesive foil with the mallet to meet morsal stress; this is the greatest possible vindication alike of the "ante-bellum" operators, who claimed soft foil as the only tooth-saver, and of those who believe in the inlay principle—a hard filling with an adhesive media—though the non-cohesive gold can no more exclude saliva like a fine cement joint than the cohesive finish can meet stress like a cast gold filling.

Knowing that in no other art is the attempt made to exclude moisture without a cementing media, it would seem the part of good sense to apply next to the tooth surfaces some adhesive which may be worked with ordinary skill to exclude the saliva and to retain such adhesive by a dense filling to meet mastication.

Early in the "seventies" J. Foster Flagg made the suggestion that every filling have interposed next the dentin a layer of cement;

if this were true at that time of the defective cements, it is doubly so to-day. Carry this fine line to the margins of the cavity by any method guaranteeing perfect adaptation of the enamel and filling edges while the cement is in a plastic state, and you will be doing a little better than ever before in the great problem of tooth conservation.

The method of burnishing foil to a cavity to form a matrix for inlays was first described, according to Wheeler, by Dr. Wm. Rollins, of Boston, in a paper read before the Society of Oral Science in 1880. In the period intervening no method has suffered more from too enthusiastic adherents. Had not the principle been correct it would never have survived the first spasm. To say with some that every operation of the future will be an inlay, or that caries never recurs about an inlay or like nonsense, is to insult the intelligence; what might be considered a fair, conservative statement of the case might be the application of porcelain inlays to all cavities in the line of vision and safe from morsal stress, and of gold inlays to all cavities out of the line of vision and exposed to morsal stress, provided always an accurate matrix could be obtained.

There are a few reasons why an inlay is the nearest approach to the ideal filling other than color in the porcelain and strength in the gold inlay. The inlay is the most difficult and the most honest of all fillings; it is so hard to make right that it never will be the "catch-penny" of the charlatan; it is honest because every man knows when he has failed and is dishonest if he sets a bad inlay; this cannot be said of other gold operations. It does not stay in the cavity and leak, deceiving the patient and operator, but comes out before any great solution of cement can occur—it is easy to see how there could be recurrent caries around, but hard to see how there could be such under an inlay. The cement is a non-conductor protecting frail walls and the dentin. Boedecker, after conclusive study of the state of the dentinal tubuli lying directly adjacent to fifty fillings of all sorts, found a more healthy reaction and greater solidification under oxyphosphate than any other. The inlay is built on a work bench other than the patient's jaws, preventing possibility of cavity wall fracture from pressure; made in short sittings it saves the patients' and operators' time and prevents nervous strain, is practically polished when set, which can be done without the rubber dam, and if displaced and captured can be reset, something to be

said of no other filling; finally, it requires no more cutting of cavity walls in cavity preparation than extension for prevention.

Lest the writer be adjudged an enthusiast and "daft" on the inlay question, it would be well to mention a grave defect, one which calls for all the thought, clinical experiment and skill of not a few to solve. It is to be found in the fact that the fine cement joint is safe when sheltered from the pump of the bite by contour; then the plugging of the cement pores by mucus is maintained, the finer the joint the safer the mucus-protecting plug and solution of cement stops, but if the joint, even when lapped as in the gold inlay, is open in the least, there is no end to the pumping out or laving of cement due to the force of soft foods in mastication. The writer has examined joints pumped open one-third way down the tooth wall, and it is not long until such give way from lack of support.

This paper is the result of painstaking observations covering several years; it is not an argument for the inlay *per se,* but rather that every filling should be inlaid or guarded by a fine line of cement for the many reasons stated.

With all of the wonderful technique developed by our profession, we too often find to our sorrow that we have attempted the physically impossible to overcome cohesion. To produce adhesion, to prevent capillarity by mere finger craft calls for powers superhuman. Let us be honest. Let us "'fess up" and say we cannot do it. Then will we have come nearer the truth, which is more becoming in us as scientific men, the only service we can offer those who call us, and the only tent our profession can afford to accept as her own.—*Dental Summary.*

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CARE AND TREATMENT OF THE MOUTH AND TEETH DURING PREGNANCY. By Dr. J. M. Stalder, Oakland, Cal. This subject, as a rule, has been omitted from the works in dental literature and relegated to those of general medicine, but the relation of the mouth and teeth to the general welfare of the patient during the term of pregnancy has become one of the principal objective points with both the physician and dentist.

We all know that a task, or some particular piece of work, cannot be done with poor tools or instruments; neither can the great problem of the continuance of the human race be solved and carried on to its fullest degree of efficiency if the individual members of the race have not the correct standard of health. The question now

arises, What is the correct standard of health? Webster says, "Health is that condition or state in which all the functions are performed fully without pain or disease; freedom from sickness and decay."

We, as practitioners of dentistry, having the care of the mouths of numerous families of children, should begin as soon as they are brought to the office for examination and dental attention to impress upon the child, and more especially the parent or guardian, the great necessity for keeping the mouth in a condition of health and comfort.

Explain the functions of the teeth; that they are made and intended to tear and masticate properly the food and prepare it for its reception into the stomach, and in order to accomplish that end, they should always be in a condition of health.

Explain the evil consequences of bolting the food (which we know is generally caused by having one or two tender spots on the teeth). Indigestion and its train of evils should be explained to both child and parent, as it is caused by not having chewed the food properly, thus throwing all that work upon the stomach.

Without the teeth being properly filled and restored to a healthy condition, the children cannot perform the several duties expected of them, neither can they properly attend to their school work and studies. These last few statements you will probably say "have no bearing upon the subject of this paper," but I consider that they lead up to the very essence of the subject.

Take, for a sample, a patient who has been under your care for the last ten or twelve years and who in all probability came under your care at the time she was in the high school, at the age of sixteen or eighteen years, or even younger. In that period of time this patient has been given the best attention possible at your command and has been educated up to the fact that preventive dentistry is better than constructive dentistry.

The physician naturally will be the first to be consulted regarding the general condition of the patient, and being a man who is progressive and desirous of giving his patient the very best of attention for her general welfare, will recommend her to her family dentist, who in turn will devote his untiring efforts and greatest skill toward the proper treatment of the mouth and teeth during this period of uneasiness and expectation.

The relation and confidence of the patient, physician and dentist should be such that there will be no hesitation on the part of any of them to review the case thoroughly, nor should there be any false modesty on the part of either to cover possible cause of general or dental affections.

It is a well established fact that during the term of pregnancy the oral and gastric secretions are extremely acid in reaction and naturally very unpleasant and irritating. Oral acidity being a very potent factor in the cause of dental caries, we will first consider that condition. The patient complains of that sour taste and burning sensation in the throat and disagreeable taste in the mouth generally upon arising in the morning and quite often during the day; also a drawn and wrinkled feeling about the posterior portion of the mouth and throat. The diagnosis of this trouble is readily made by the use of litmus paper, which will be colored red if the saliva is acid. The treatment is both local and systemic.

Local treatment consists in the use of washes of alkaline reaction, such as sodium bicarbonate, chalk solution, lime water, but best of all is the milk of magnesia solution which should be used as a mouth wash several times per day and especially before retiring. Systemic treatment embraces the use of the aforesaid agents, together with very mild laxatives in small quantities, as the salts of epsom, magnesia or sal hepatica.

The rapid decay of the teeth seen in many women during pregnancy is not due to the deficiency of lime salts in the blood, as it never has been shown that there is such a deficiency, but it is beyond an iota of a doubt that acid eructations, vomiting and regurgitations from a disordered or dyspeptic stomach in the early months of pregnancy are the real and most potent causes.

Statistics show the number of teeth attacked, and the rapidity of dental caries to be directly proportionate to the frequency, intensity and persistency of acid dyspepsia with acid eructations and vomiting.

Biro has shown that mere pregnancy, aside from causing acid dyspepsia, has no effect upon the teeth. Dental caries lapping over into or originating during pregnancy should receive immediate attention, and the cavities of decay should be cut out and filled, if not as a permanent measure, then in the nature of a palliative one, to tide the patient over until such time as her condition will permit

of a more thorough operation. Severe dental operations, without proper sedative and obtunding treatment, should be avoided.

In deep cavities or those encroaching upon the cornua of the dental pulp, a palliative treatment of zinc oxid combined with orthoform and carbolized resin may be sealed up in the tooth for several months with a little thin cement, without pain or inconvenience to the patient, whereas the excavating of the same cavity for a metal filling would require a tedious sitting and probably devitalization at a time when the patient was not in a physical condition for such procedure. Of course, before inserting the cement the greatest possible amount of decay should be gotten out of the cavity, but always consistent with the feelings of the patient.

Gingivitis, or inflammation of the gums, due to blood changes of pregnancy, is quite a common affection. It usually subsides after the birth of the child, although it may continue throughout lactation. It is generally coincident with salivation, although it may occur alone and is more frequently seen in multigravid than in primigravid.

The gums are swollen and tender and bleed at the slightest touch; they are retracted and leave the necks of the teeth exposed to all the secretions of the mouth, and as those are frequently so acid their effect upon the teeth is deleterious. The teeth naturally become much loosened and render mastication very painful and difficult and the rest of the mouth may be involved, the process extending to the pharynx and stomach, and rendering the breath very fetid and disagreeable.

The treatment requires alkaline and astringent washes and very careful attention to technique of cleaning.

Chlorate of Potassa.....drachms ii
Kramerie ..... ..
Glycerin, of each .....ounces ½
Aqua Rose, enough to make.....ounces vi
S.—As a mouth wash frequently, or
Tr. Kramerie .....ounces i
Tr. Opii .....ounces ½
Tr. Myrrhe .....ounces i
Aq. Rose, enough for.....ounces vi
S.—As a mouth wash.

Abscess of any of the teeth present, or exudation of pus into the stomach, should be corrected as early as possible.

Necrosis and bone caries resulting from loose crowns and bridge work should be given the most careful attention and the offending crowns or other artificial dentures should be immediately removed. We have all been taught to save every tooth, if possible, but in cases like the foregoing the only way to save them seems to be the forcep.

Extracting of teeth during pregnancy is an operation requiring a peculiar and great responsibility and tact on the part of the dental practitioner. He must be thoroughly acquainted with the condition of the patient and must obtain her absolute confidence; he must be affable and pleasing, at the same time firm and positive in his convictions and decisive in his movements; all undue gestures and false movements should be avoided. In tooth extractions few and positive movements are desired.

It is a mooted question at what period to extract teeth. The general condition of the patient, the severity of her tooth affection, past history and mental condition and confidence are all to be considered.

Anesthetics are frowned upon by some medical men while others caution no extractions without their use. Most of us, when we are called upon to extract teeth during the period of pregnancy, consult with the family medical adviser of the patient as to the advisability of such an operation, and if it is decided to go ahead with the case and the patient can take a general anesthetic, we advise that the operation is better to be accomplished at the patient's own home in bed.

Extracting at the home of the patient who is in bed is most conveniently accomplished with the patient's head resting on a small pillow over the foot board near either the right or left side of the bed as the light and case may require. A neck basin and small sponges made from absorbent cotton wrung out in warm water should not be forgotten in this operation.

After extracting, the sockets of the teeth should be washed with warm water in which some of the astringent drugs have been dissolved or mixed, and in turn the socket wiped out with absorbent cotton and orthoform dusting powder liberally blown into the socket. A warm solution of salt water to be used for the following week

two or three times a day as a mouth wash aids greatly in healing the mouth and gums.

Salivation or ptyalism occurs, if at all, in the early months of pregnancy, consisting in a profuse secretion of saliva and patient suffers from a continual dribbling of saliva which is very annoying. This condition is supposed to be due to "neurosis of toxemia." Sometimes two or more quarts of saliva in twenty-four hours will be exuded; the general health may be impaired by this trouble, and very often this trouble continues up to the time of confinement, and even after. The danger to the patient lies in the constant drain upon the general system.

"Examinations of the saliva have shown that it was not normal, the organic and inorganic substances were greatly diminished, while the water was greatly increased; the ptyalin was wholly absent, thus depriving the saliva of the digestive qualities." The mucous membrane of the mouth is red and swollen, but there is no fever, thus distinguishing this disease from mercurial ptyalism.

The treatment embraces astringent washes and lozenges, tannic acid, chlorate of potassa, zinc chlorid, kramerie, catechu, etc., etc. Counter-irritation over the parotid gland is also beneficial. Bromides are very useful in this trouble, and the general health very important. —*Pacific Dental Gazette.*

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STUDIES OF THE BEGINNINGS OF CARIES IN ENAMEL WITH REFERENCE TO FILLING TEETH. By G. V. Black, M.D., D.D.S., Chicago, Ill. The study of dental caries as it relates to dentin may now be regarded as complete. After twenty years of careful research by the best men of the world, the studies by Dr. W. D. Miller of Berlin have met with general approval as to correctness, both in principle and detail. It may now be said that careful thinking men are agreed upon all of the principal facts of the relation of microorganisms to these processes, and the nature and order of the processes themselves. Discussion is practically closed.

Studies of caries of enamel have not yet progressed to completeness. Certain facts only have been completely made out and agreed upon. It is now well known that caries of enamel is in a general way due to lactic acid produced by the fermentative processes of microorganisms growing in the mouth, but it is not universally

conceded that this is the only way in which caries of enamel may begin. In one of the more recent utterances of Dr. Miller, in an allusion to caries of buccal surfaces, he seems to throw doubt upon this and attributes the beginning of decay of the enamel in certain cases to a perverted secretion from the gingivæ. But that the primary agent of attack is an acid, I think all are agreed. Also all are agreed seemingly that it is the cementing substance between the enamel rods that is attacked first, and that as this is dissolved out, the rods themselves are loosened, and finally fall away, or are themselves dissolved. The extent of the solution of the cement substance from between the enamel rods, as compared with the solution of the rods in caries of the enamel, is far greater in all protected places than the general profession formerly supposed. Indeed, upon proximal surfaces it often appears that the enamel rods are not dissolved at all, or at most but very slightly, and that they do not as a rule fall away until their connection with the dentin has been broken up by solution of the calcium salts of some considerable portion of the dentin. Until this time no microorganisms have entered the dentin. This important fact I have been able to determine through work with new apparatus for slicing teeth and grinding sections, which enables me to obtain good sections of the frailest material.

Other factors that enter into and control the action of acids in the beginning of caries of the enamel are yet in what may be called the stage of discussion. That which one man may claim as a fact many others will regard as an opinion, or without impropriety may claim that the evidence is insufficient, etc. So long as this is the case no one, perhaps, has the right to say dogmatically that such and such a thing is true, especially if he cannot formulate plans and prove it by laboratory experiment, that others may follow and substantiate or disprove his claims.

Among the important questions now in this condition, in relation to the first beginnings of caries of the enamel, are these:

1. By what power or influences is the localization of the beginnings of caries of the enamel controlled?

We find as a fact that in something more than ninety-five per cent of the cases the beginning of caries occurs in one of three positions upon the teeth—(1) pits and fissures, (2) proximal surfaces, and (3) buccal (or labial) surfaces.

In the first it is sufficiently evident that the existence of the pit gives the opportunity for the beginning of decay. The last two, if we include the lingual surface, which occasionally exhibits a like tendency in cases of extreme susceptibility, forms a band encircling the crown of the tooth near the free margin of the gum following its curvature as it arches over through the interproximal space. As a rule the anatomical angles of the teeth, reaching from occlusal to gingival, are immune, thus confining the beginnings of decay to the buccal and proximal surfaces in all cases except those of extraordinary susceptibility.

We find further that decay does not occur by reason of acid developed in the general saliva, for most immune persons have saliva that is acid to the litmus test. If it did occur from this cause the teeth would decay all over, which they do not do. This was pointed out by Dicerebode in 1838, and has been before the profession for more than sixty years, though forgotten or overlooked by many writers. The acid causing decay must be formed immediately at the point of attack under conditions that prevent its solution in the general oral secretions.

2. By what power, or by what circumstances, is immunity from or susceptibility to dental caries controlled?

This is properly divisible into four divisions: (1) Why is it that the child who suffers badly from caries may become immune as he or she grows older, provided the decay occurring in youth is so controlled as to prevent destruction of the teeth? (2) Why is it that the person who has been immune to the beginnings of decay of the teeth develops susceptibility? This susceptibility seems evidently due to some systemic change, since it is often of short duration; immunity again recurring after a longer or shorter period of susceptibility. (3) Why is it that susceptibility is so often renewed or greatly increased in pregnant women? (4) Again, why is it that susceptibility to dental caries so frequently again recurs in old age in the form known as senile decay?

It seems to me quite probable that in its final solution it will be found that the same or very similar causes are active in these several conditions, resolving the questions into the one first stated.

In former years these divisions of the question were differently explained. The *localization of decay* was thought to be due to imperfections or weakness of the tooth structure itself at the points

attacked. Of course, this could not be certainly shown after the attack because of the destruction of the tissue. The greater range of observation, however, that has now been had shows perfect tissue on proximal surfaces to be so general that the counter observation that upon occlusal surfaces decay is limited to such imperfections as pits and fissures, is no longer sufficient reason for assuming imperfections on proximal surfaces.

The second division, regarding *susceptibiiity and immunity* had long been explained on the supposition that some teeth were poorly calcified and for that reason decayed readily, while other teeth were well calcified and decayed slowly or did not decay at all. Becoming immune after the susceptibility of childhood and youth was explained on the supposition that the teeth were poorly calcified and soft in childhood and became harder and more dense later. Also it was claimed that the teeth of pregnant women became soft because of the abstraction of calcium salts to build up the bones of the fetus and therefore often decayed badly during such periods, and during the depletion resulting from lactation. Still further, periods of interference with the proper nutrition of the teeth were charged as the underlying causes of the reappearance of caries occasionally noted after a considerable period of immunity. You will note that in all of this, decay of the teeth was charged to imperfection or weakness of the teeth themselves.

All of this was broken down in 1895 by rigid investigation of the physical character of the teeth in which the condition as to calcification was the principal factor studied. In this it was clearly shown that the differences in the calcification of the teeth supposed did not exist; that so far as affecting the solution of their calcium salts all teeth were found, practically, equally hard.

Since the publication of the papers, which at that time raised a storm of disapproval, I have waited and watched the results of the work of others for the development of any facts that would justify a different explanation; but it seems that all research only tends to confirm the results then announced. In this I include the utterances of Dr. C. S. Tomes before the British Dental Association, 1896, and Dr. Miller's most excellent and exhaustive studies of the action of acids upon the calcium salts of teeth from persons supposed to be in the different conditions of susceptibility and immunity, given at the fourth International Dental Congress in St. Louis in 1904.

It may now be regarded as firmly established that dental caries does not occur because of any faults in the calcification of the teeth further than that pits, grooves and accidental physical imperfections give greater opportunity for the cause of caries to act. There is no such thing as soft teeth and hard teeth in the sense that these phrases have heretofore been used. Neither susceptibility to decay nor immunity from decay are in any wise dependent upon variations in chemical composition of the tissues of the teeth, but must be dependent upon the oral secretions and what they may contain that enables the fermentative process to develop substances that may act upon them, and localize that action.

Returning now to the two propositions named, the factors that control the localization of the beginnings of caries, and those that control immunity and susceptibility, we find them really the questions the solution of which is most likely to enable us to control dental caries. For, if caries is the result of a dyscrasia—a systemic condition—we have a hope that by gaining a knowledge of it we may find a way of controlling it by medication, mode of life, or other means, and thus master the difficulty at its inception. Really our more extended knowledge in recent years of caries of dentin has not given us much greater control of the affection. Extension of decay in the dentin is at most a secondary incident in the destructive process. It is not the beginning. It is the beginnings of caries of enamel that interest us most. If we can learn to prevent caries of enamel, caries of dentin will not occur. What improvement we have made in filling teeth in recent years, other than that which is purely mechanical, is due mostly to the studies of the forms, localities and surroundings of the beginnings and superficial spreading of caries of enamel; the laying of plans to place enamel margins on the less susceptible lines to avoid the recurrence of caries, etc.

These two questions relative to caries of enamel, with their variations of detail, are the main questions now before us for experimental research, discussion and final settlement. A glance at the purport of these questions will show that they, after all, are the main practical questions, the solution of which will in the future become our guide in the treatment of dental caries. The plain indications are that this treatment will be directed to the general system for the correction of the secretions and the control of the environment in which the teeth are placed. This in a large degree should take the

place of the present plans of prophylactic treatment and treatment by mechanical repair. Thus far we have treated caries almost entirely by the mechanical repair of the injuries it has inflicted. True, we have learned (some of us) in these later days to do this in such a way as to prevent much of that recurrence of decay of former-day filling operations, but still it remains mechanical treatment pure and simple on the general plan of repair work. While in the broader sense it may be adapted to the alleviation of pathological conditions, still it is not curative, in that the condition of susceptibility is not removed.

On the first of these propositions I personally have had definite ideas, developed principally through my work in bacteriology and histo-pathological studies of the beginnings of caries of enamel, together with observation in the mouth, which reduces the two propositions almost to one, they are so closely related. It is this:

While the beginnings of caries of the teeth is caused directly by acid produced by the fermentative action of certain varieties of microörganisms which grow in the oral secretions, the particular character of this growth required to bring about the local concentration and application of the acid produced so that it may act to cause the beginning and spreading of caries, is under the control of certain systemic conditions not yet accurately defined. These conditions so modify the general fluids of the mouth that these certain microöganisms growing in it produce a gelatinoid material as a by-product in one case and do not produce this in another case. In the second case there are no beginnings of caries of the enamel, hence no decay of the teeth. In the first case this gelatinoid material grows and clings to the teeth in sheltered places, the bacteria growing in it, or under it, or both. This gelatinoid material acts as a dialyzing membrane passing *in* the salts from the saliva (sugars, etc.) which keep up fermentation, and passing *out* the salts to the saliva (lactate of calcium, etc.) that result from the acid solution, or decomposition, of the tooth structure, thus eliminating the waste product of the organisms, promoting and keeping up the process of fermentation in apposition with the tooth surface in such a way that the acids formed are not diffused in the saliva, or washed away as acids.

Generally it is the growth of acid forming bacteria in the saliva that causes its acidity, but this acidity of the general fluids of the

mouth is not, as previously stated, a cause of dental caries. For years I made it my business to search out immunes—those who never had decay of their teeth—and enlist their interest and aid in the study by giving me the opportunity to study the fluids of their mouths. In these I have as constantly found the saliva acid to the litmus test as in the mouths of those especially susceptible to dental caries. Further, I have cultivated microörganisms from these mouths. In them I have found the same species growing and apparently in similar quantities. I have taken their own saliva as culture media and compared the growth of microörganisms with similar growths in saliva from those who were very susceptible to caries. So far as mere quantity of growth or final acidity of the product was concerned, there seemed to be no very important differences. I bring this forward to impress you with this one point which I believe to be a rational fact not appreciated by many men. Growth of microöganisms in the saliva with fermentation and the production of lactic acid is a necessary concomitant to the beginning of caries, but it is not the only necessary factor in the localization and production of the beginnings of dental caries. It requires growth and production of acids in contact with tooth surfaces under conditions that will prevent diffusion of the acid in the general saliva and apply it directly to the solution of tooth material, or calcium salts. This is accomplished in highest degree by the production of the zoöglea forms of growth or the massing of bacteria in gelatinoid products in contact with the teeth in sheltered positions. This is the condition as we find it in nature. I have several times copied it in an artificial way by placing bands upon the teeth of immunes, leaving a little portion without cement. This band will allow of a growth of microorganisms between it and the tooth at the uncemented point, and will act as a shield to prevent the too rapid diffusion of the acid formed and caries will result even in persons who otherwise never had a carious cavity. It is therefore not necessary that a gelatinoid material be formed to enable decay to start in a deep pit, fissure or other point that may be sufficiently secluded by impaction of fermentable food material, to shield the acids formed from dissipation in the oral fluids. But in the main on the smooth surfaces of the teeth it seems to be the growth of microörganisms in the zoöglea forms that causes the localization of caries and the gradual spread on the surface of the enamel.

I have written of this more at length and more specifically for the reason that when certain elements or their salts have been said to have been found uniformly in the saliva of immunes, someone has hurried to his culture oven and quickly proclaimed that micro-organisms grew well in the presence of greater quantities of this particular salt than was ever present in the saliva. Therefore this material could not be responsible for the immunity.

This to my mind is in no sense a reason why these substances may not be responsible for the immunity. The acid producing micro-organisms responsible for dental caries will grow well in a culture medium devoid of sugar, starch, etc., but under these conditions they will not produce an acid product. Here a principal product is completely changed for another not yet accurately known. In the other case a by-product only is changed. It is this by-product that creates the conditions that render the action of the principal product operative; enabling the organisms and their acids to act in the one case and causing their failure to do so in another.

But as yet I cannot prove these things at will. I have grown this gelatinoid material in my culture tubes, but have not been able to formulate plans by which I can do so at will with regularity, and therefore cannot direct others with certainty in the repetition of the experiment. I have also taken these gelatinoid growths off of teeth in the mouth, demonstrating their presence over beginning decays, but I am by no means able to do this in every case of beginning caries, even upon buccal and labial surfaces when the best opportunities seem to be afforded. I fully believe, however, that the plaque has been there. Until I am able to do one or the other of these with reasonable certainty and can direct others how to repeat the observations, I probably should recognize the right of others to say "not proved."

I want to state here distinctly, as I have frequently stated before, that it is not loose aggregations of microörganisms clinging to the teeth, greasy masses, inspissated mucus, or mere slime that I speak of here as gelatined substance or zoöglea forms of microbic growths. It is not difficult to show any amount of such material in microscopic slides. All such masses are readily penetrated by the saliva and any acids developed in them are washed away almost or quite as readily as if they did not exist. They cannot be favorable to beginning caries. Not infrequently the decomposition in these is

putrefactive and no acid is formed; in this case they act directly to stop the advance of any incipient caries that may have begun.

In the meantime Dr. Michaels has confidently asserted that in those manifestly susceptible to caries there is a superabundance of ammonium salts, and an absence of sulphocyanates in the saliva. In those immune to dental caries, he finds a diminution of or an absence of the ammonium salts, and the presence of sulphocyanates. So constantly do these conditions occur in these relations as to render them necessary conditions to the beginnings of dental caries on the one hand and the condition of immunity on the other.

In the Dental Cosmos for February, 1906, page 190, Dr. F. W. Low of Buffalo, N. Y., by working along somewhat similar lines, has practically confirmed Dr. Michaels' findings. As I understand Dr. Low's report, he finds in typical susceptibility to dental caries an excess of ammonium salts and an absence of sulphocyanates. In typical immunity he finds an excess of sulphocyanates and a reduced amount of ammonium salts. Several other observers are reporting similar results.

In Dr. Low's report there seems to me to be some incongruities that further studies may dispel. In any case the work must be continued perhaps for years before unimpeachable and working conclusions can be had. All of the methods of chemical experiment must be sifted for error and put into practice by other experts until the last opportunity for error has been removed, before the word "proved" can confidently be pronounced.

Whatever may finally be determined as the full truth in this matter it is sufficiently evident that the present methods of treatment of dental caries will not be seriously disturbed or changed for years. It is therefore of the first necessity to the communities we serve that we continue to improve these by all the means in our power. To these ends it is of the greatest necessity that we study the beginnings of and the spreading of caries of the enamel in all of its phases closer and closer as the years go by. Especially we need to study more closely the areas of susceptibility and areas of immunity of the teeth, and the forms and the surroundings of the beginnings and spread of caries of enamel among our patients, and compare these with that which is adduced from time to time by scientific research, in order that we may render our work at the chair more effective. Experiments not only show what has formerly

been known, that in its first beginning it is the solution of the cementing substance between the enamel rods, but that this may go on until the rods are cut off from their attachment to the dentin before a single rod is broken or falls away. A very considerable solution of calcium salts usually occurs in the dentin before there is any entrance of microörganisms into the structure of the tooth. All of this is accomplished by acids formed upon the surface of the tooth by microörganisms clinging to it and producing fermentation more or less continuously.

In this my observation shows the rule to be that there is a certain sheltered point which forms the nidus of decay. These are often very small or possibly divided into two or more points in the beginning in proximal or buccal surfaces, forming a line near the free border of the gum. These spread and run together. In studying these, especially in cross sections in which we can cut lengthwise the area of beginning decay, we find the points of beginning marked by the greater depth of the penetration of the acid. When the growth begins at one of these points the tendency is to spread in every direction that the conditions as to disturbance and removal of the microörganisms clinging to the surface of the tooth will allow. The result is that decays of the enamel starting from a single nidus are usually in the form of a cone with a broad base at the surface of the enamel. In all cases the spreading is clearly on the surface of the enamel. There is no lateral spreading of decay within the enamel tissue. A solution of the cement substance between the enamel rods having begun on the surface, follows the length of the rod to the dentin without perceptible lateral movement. The rate of superficial spreading compared with the penetration is clearly marked.

When the enamel has fallen to pieces and the decay becomes seated within the dentin and an open cavity is formed, the conditions are often wholly changed. The central nidus favorable to the attachment of microörganisms is lost and the conditions often prevent the attachment of a new growth. Therefore, further superficial spreading does not occur. It appears from many examinations that if the spreading of decay has been small in area, when the central area of enamel falls away no superficial decay of enamel will be seen about it. But if a filling is made restoring the original form of the tooth, the nidus for reattachment is again formed and the

growth recurs on the filling as it did upon the tooth. Then there is the tendency to spread beyond the margins of the filling, causing a recurrence of decay.

In recent observations in the mouth I have found the gelatinoid material clinging with remarkable tenacity to gold, amalgam and porcelain fillings, and extending its borders out beyond their margins onto the enamel, carrying with it the beginning of recurring decay as was manifested by the whitening of the enamel surface in some, and the actual breaking down of the enamel in others. Indeed, some recent observations in this direction have surprised me. For it appears that an excellent filling may serve, in some instances at least, as a bridge for a wider extension of decay of the enamel than would occur if the filling had not been made. I have observed this especially in some labial decays where the opportunity for effective inspection of the conditions were especially favorable. That this same disposition to extension occurs about proximal fillings is none the less manifest. Therefore those who claim no more extension is necessary because there is no showing of caries of enamel about their cavity margin, will often be caught with extensions of decay where they least expect it.

I have frequently heard the remark that microörganisms did not accumulate upon porcelain inlays, but examination of these shows the same conditions as are found in other fillings and the teeth themselves. Indeed upon porcelain inlays and other fillings they seem to cling very much closer than to the enamel, for the process of solution of the calcium salts which is going on under the latter and is lacking in the former has the tendency to loosen them, rendering them more easily removed. I think that the idea that this attachment does not occur on porcelain inlays is derived from the fact that the cavities for these have been cut much wider than the same operators have done for metallic fillings, in most instances laying the margins on immune lines, making it impossible for the margin to be overlapped by such spreading.

In the preparation of cavities for metallic or inlaid fillings in occlusal surfaces, the only extension called for, after removing all undermined enamel, is to follow out sharp grooves to such a point as will afford the opportunity to make a good, smooth finish of the filling. In these there is no tendency to the extension of caries on the surface and further precautions are unnecessary. But in the

preparation of cavities in the proximal or buccal surfaces (or any of the smooth surfaces of the teeth) the case is entirely different. It is in these that the beginnings of decay of the enamel spread superficially and in these careful systematic extension for prevention is called for. In the preparation of these we must depend upon our knowledge of immune and susceptible areas of the surfaces of the particular teeth, and our judgment of the degree of susceptibility of the individual, and always endeavor so to lay cavity margins that they will include all of that area of the surface operated upon, to which caries is liable to spread in that individual. This information and judgment must be derived from the general studies one may make of immune and susceptible areas of the surfaces of the teeth together with the most abundant observation possible of the superficial spreading of caries; from careful examinations and studies of the tendencies in the individual and from studies of the hereditary tendencies in the individual's family, and the combination of these factors with the age and habits of the patient. With these well considered, such extension of cavity margins toward the least susceptible areas should be made as will give the least probability of the spreading overlapping the margin of the filling and causing a recurrence of decay in that surface of the tooth. Often in proximal surfaces of the teeth this may be better done by changing the relation of the surfaces of the adjoining teeth to each other by wide separations, and building prominent contact points than by very wide cutting.

In all of this we must keep in mind closely the limitation of extension for prevention; that is, that in the normal relations of the teeth to each other the angles of the teeth are to be approached, but never passed in the extension of the margins of cavities. Normally the angles of the teeth reaching from occlusal to gingival are the lines of greatest cleanliness upon the axial surfaces of the teeth and therefore these are the lines of safety upon which decay occurs or spreads past from any direction least often. Also the openings of the embrasures and the disposition of food to run through them, and clean their area from occlusal to gingival in its excursions, should receive the most careful study. Often plans may be laid to facilitate by slight changes of form this kind of cleaning of margins of fillings. These points call for our greatest care in very susceptible persons, remembering always that the approach of

cavity margins to the least susceptible areas is what is called for. We should never pass such a line unless driven to it by extension of caries either upon the surface of the enamel or in the dentin undermining the enamel to such an extent as to cause it to be unsafe.—*Dental Review.*

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ORAL SANITATION. By Burton Lee Thorpe, M.D., D.D.S., St. Louis, Mo. The profession is awakened to the fact that oral hygiene and prophylaxis are the important factors in the preservation of the human teeth. The practice of this branch of dental surgery, which was formerly known as "cleaning the teeth" or "scaling the teeth," and done in a haphazard manner by the busy dental operator or turned over to his assistant, now demands the time, skill and thoroughness that other operative procedures do, as well as a fee commensurate for the service rendered. The mouth is the barometer which indicates the general health of the average patient. It also is the incubator of many systemic diseases of the intestinal tract. Indigestion, dyspepsia, gastritis, appendicitis, influenza, etc., can be traced to infection caused by defective hygiene of the mouth, excited by the excessive accumulation of salivary calculus and food debris, hypertrophied gums, caries, remains of roots of teeth and their sequelæ, etc.

Oral sepsis is the predisposing cause of influenza, and the mouth is the breeding place of the bacillus influenza, dipticoccus diphtheria and pneumonia germs. Patients having hygienic mouths are practically immune from these and other systemic infections, as well as partially immune from caries.

Granting that the statement that "*clean teeth never decay*" is mainly correct, yet, thinking members of the profession now realize from the experiments of Professors Michaels, Black, Miller, Kirk, and others, that cleanliness alone is not the only factor to prevent tooth disintegration, and that the blood serum, saliva and urine are also potent factors to be reckoned with in the inhibition of dental caries. Environment has as much to do with tooth decay as does oral sepsis, but until our teachers tell us how to overcome wholly and scientifically the environment, oral hygiene must be our forte.

We may say safely clean teeth do not decay as rapidly as unclean teeth, and it is the dentist's duty to keep the mouths of his clientele in a hygienic condition. This may be accomplished, in some mouths,

by at least semi-annual or, if necessary, more frequent visits to the dentist, when all deposits should be removed with proper instruments, spongy gums treated and cured, and the teeth polished. This, in the writer's opinion, is the greatest service the operator can render his patient. With this should go both preaching and teaching the patient the when, why and how to brush the teeth and gums properly, for the thorough cleansing and massaging of the gums, tongue, palate, cheek and lip muscles is a far more important feature than simply brushing the teeth.

The first step indicated in putting the mouth in a sanitary condition is the thorough removal of all calcic deposits. This can be accomplished with hand scalers and gold plug finishing burs, to be followed by the bristle brushes, buffs or rubber cups, whichever is best suited to the operator's need. Few instruments are needed to scale a set of teeth. Those I use are a modification of the old style Riggs' scalers, to be used both as a push and pull instrument; with them it is possible to remove all deposits. The instrument should be honed on an Arkansas stone before using, as should all scalers, chisels and excavators.

Many employ orangewood sticks, on which powdered pumice is carried and applied to inaccessible surfaces. The writer has long ago discarded this method and used instead the porte-polisher of Dr. H. B. Harrell, of Gainesville, Texas, which carries an ordinary wooden shoe-peg, with which nearly all surfaces of a set of teeth may be reached. An improvement on this is the latest contribution of that mechanical genius, Dr. C. L. Alexander, of Charlotte, N. C. An instrument known as Alexander's "prophylactic and massaging dental engine hand-piece," which is a combination scaler and porte-polisher, a most valuable instrument in the practice of oral hygiene, and a great time-saver to the operator. This instrument, constructed with a ratchet in its shaft, makes an excellent carrier for pumice powder placed in position around the teeth before using, on rubber cups or wooden shoe-pegs, which are soft and, when wet, easily adaptable to tooth surfaces. With this instrument you have the advantage of using hand pressure in connection with the frictional movement imparted by the engine. The handpiece also makes a good engine plugger for inaccessible cavities, the blow being regulated by the distance the plugger point is held from the work. After scaling and polishing the teeth, some medicinal application is indi-

cated to heal the wounded gum tissue, to shrink and harden the same and prevent sensitiveness at the necks of the teeth. For this a ten per cent solution of silver nitrate, which does not cauterize the mucous tissue, is the best; it should be applied freely to both teeth and gums on a large pledget of cotton, and should *not be followed by rinsing the mouth with water,* as this washes away the astringent and lessens the therapeutic effect of the solution. By some objection is made that nitrate of silver solution permanently stains the enamel of the teeth. This is not true; the stains are easily removed at some subsequent sitting with pumice powder applied on rubber cups or brushes. Nitrate of silver is not only the best remedy to overcome both sponginess of the gums and sensitiveness of teeth, but it also *prevents future decay.* I have seen scores of mouths of the patients of Dr. Conrad, who has used this remedy for years; with it he has absolutely practiced preventive dentistry.

*Caution Regarding Nitrate of Silver.*—In mouths having porcelain inlays, before applying nitrate of silver, the inlay and its tooth margins should be dried and painted with a thick coating of some of the resin varnishes which, when dried, prevent the silver solution penetrating the inlay margins and permanently discoloring it.

Some operators prefer a twenty-five per cent solution of zinc chlorid, which does not stain the teeth and is excellent for relieving sensitiveness at the necks of the teeth. I find, however, that patients object to the taste and after-pain of this remedy more than to the silver nitrate solution. In cases where the gum tissue is excessively hypertrophied, covering, say, a half or third of the tooth, I practice immediate gum excision with a sharp lancet. This operation is preceded by a local anesthetic and followed with several daily treatments of silver nitrate. In other cases of spongy gums with pus sockets a few applications to the pocket of a wisp of cotton, inserted on a smooth broach, of full strength lactic acid, works wonders toward shrinking abnormal gum growth. The toothbrush should be of flat surface, with very stiff bristles, and the patient instructed to use it five times daily, if possible, i. e., the first thing on rising in the morning, after each meal and the last thing before retiring at night. While giving this advice, it is safe to wager only one out of a possible thousand will follow it; however, if by begging, pleading, bluffing or bullying you are able to get your patients to follow it, you have worked to their greatest good. The profession needs

some systematized plan by which to instruct their patients how to brush their teeth. It is hoped the Committee on Oral Hygiene of the National Dental Association will soon give the profession such advice and instruction.

*The toothpick habit,* one of the vulgarities of American civilization, seen these days in all classes of society, should be discouraged in public, especially the use of the wooden toothpick, unless possibly it is of hard wood and has a smooth, round point. As a rule, all toothpicks are detrimental, causing irritation to and laceration of the gum septum by crowding food particles and septic matter under the gum, resulting in chronic gingivitis and periostitis in some cases. The use of floss silk and small rubber bands is far preferable.

Another useful instrument incident to oral sanitation, for use in mouths of those having the prevalent constipated, furred tongue, is the celluloid tongue-scraper placed on the market by a firm of dental manufacturers. By prescribing this instrument for daily use, many mouths may be relieved of the fur-like coating of mucus, so injurious both to the patient's teeth and breath. As to the mouth-wash indicated, that must be left to the individual preference of the operator. Personally, I prefer a penetrating alkaline antiseptic mouth-wash, with an alcohol base, which I believe superior to all others. Another "habit" I try to get my patients to adopt is the nightly use, just prior to retiring, of the saturated solution of milk of magnesia, which forms an alkalin coating which neutralizes the acidity from stomach and saliva. This I believe to be one of the best preventive agents against dental decay.—*Dental Brief.*

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ATTACHING FACINGS TO CAPS WITH PORCELAIN.—Make the cap of platinum soldered with pure gold. The post should be of platinum or iridio-platinum. Let facing end of post extend one-quarter of an inch from cap and take impression with cap and post in position on the root. Take bite if necessary. Set cap and post in impression and run cast of investment compound. Grind facing to suit and bend pins up out of the way, but closely in contact with protruding end of post. Cut off unnecessary end of post, leaving enough to reach pins. Invest and attach post to pins and cap with a little pure gold. Remove investment and bake on the porcelain body. The first baking should not extend higher than the pins or the contraction upon cooling might check the facing. This makes a much stronger crown than where facing is backed and soldered to cap, is little more trouble and costs less.—R. E. SPARKS, *Dental Review.*

# The Dental Digest.

PUBLISHED THE LAST WEEK OF EVERY MONTH

At 2231 Prairie Avenue, Chicago,

Where All Communications Should be Addressed.

## Editorial.

### WHAT CONSTITUTES TRUE EDUCATION?

In the present hue and cry for manual training certain serious facts seem to be overlooked, the chief of which is, that back of all hand work that amounts to anything must be the *thinking* mind.

We speak of skilled labor, and, if we mean more than mechanical dexterity, such as any mountebank may exhibit at a country show, we mean by the word "skilled" that the hand readily obeys the command of the brain. Enterprising shopkeepers frequently seek to draw a crowd to their store windows by placing in the window a seedy looking individual who can produce an oil painting in ten minutes, add distant mountains and a rising sun for fifty cents a piece. He evidently has had manual training with the paint brush, but do we call him an artist? Would we care to hang one of his productions on our parlor wall? The real artist thinks long and earnestly before he begins his picture. He has in his mind the memory of what other artists have done. He has traveled and read, and all of this mental training shows itself in the strength and vigor of his picture; in its good composition, or its delicate refinement as the case may be.

At a recent convention held in Chicago a demigod rose, and in loud and ranting tones exclaimed: "Let us do away with the accumulation of millions in the hands of the few and we will do away with the evils of which you complain. A swollen fortune is a stolen fortune!" A wideawake business man known and respected throughout the community for his honesty and integrity stepped quickly to the front and said: "Mr. Chairman, I object to the statement of the last speaker, if by a swollen

fortune he means a large fortune. The majority of successful business men have been successful not because they have used dishonest methods, but because they *thought*. It is true that disgraceful disclosures are being revealed in the business world, but they are a small minority compared to the thousands of honest business men that carry on the trade of this great country, and I insist that in business as in every other line of work it is the thinking man who wins success." He then went on to show how the merchant must read not only the market reports, but keep himself informed as to what other merchants in other parts of the world are doing. What new and cheaper means of transportation can be obtained, where he can best buy, where best sell. In a word, how he must educate himself along his line of work if he would really succeed.

It is a well-known fact in psychology that the body and the mind are so intimately connected that they act and react upon each other in a most marvelous fashion. Admitting the full value of manual training as one means of developing mental power, when compared to the power given to the hand by the trained brain, it is small indeed. No man is master of his work until he is master of the thought that lies behind that work and that caused it to come into existence. Once master of this he seeks ways and means for accomplishing his purpose. Otherwise he remains a mechanic, an artisan, a tool for other men to use. Particularly is this true in the lines of work that are based on scientific knowledge.

The question of manual training in connection with educational institutions is a serious problem all over the country at this time. Manual training or the working of the fingers to the average student is much more attractive than the training of the mind or hard study, and if this applies to general educational institutions how much more so to dental schools. If what we have outlined in regard to mental training is correct, namely, that the artist and the merchant or any successful business man must be a thinker, the same thing will apply with quite as much emphasis to the dentist who undertakes to deal with part of the human body, and that an all-important part. It is a well-known fact that the dental student is usually most eager to commence his manual training, and we believe it to be a mistake to allow him

to have anything to do with the handling of patients or the technique of dentistry until he has gotten well started in his scientific studies.

Can a true dentist become a master of his work by merely learning how to handle his instruments dexterously? Are not the teeth an organic part of the body? Does not every thoughtful dentist of experience know that the condition of the teeth depends largely upon the condition of the body as a whole, and that the digestion and circulation of a patient need to be studied as well as the condition of his teeth if he is to have our best service, and what less than that does an honest man wish to give?

Again, in this day of large experimentation and minute laboratory work, no man can keep up with the rapid advance of science unaided by a knowledge of what other men working along the same lines are doing. Let us then have more reading, more scientific research among our young dentists, less dependence upon mere mechanical skill. In other words, let us demand that we remain a profession and do not degenerate into mere tooth carpenters.

## Notices.

### PENNSYLVANIA STATE DENTAL SOCIETY.

The Pennsylvania State Dental Society will hold its thirty-ninth annual meeting on July 9, 10, and 11, 1907, at the Hotel Schenley, Pittsburg, Pa.

L. M. WEAVER, Recording Secy.,
7103 Woodland Ave., Philadelphia, Pa.

### EASTERN INDIANA DENTAL ASSOCIATION.

The Eastern Indiana Dental Association meets in Anderson, Ind., May 14 and 15, 1907. Good clinics. Good papers. Everybody invited. Everybody who comes is a member.

C. W. ORLAND,
Anderson, Ind.

### IOWA STATE DENTAL SOCIETY.

The forty-fifth annual meeting of the Iowa State Dental Society will be held at Cedar Rapids, Iowa, May 7, 8 and 9, 1907. A good program is being arranged. A cordial invitation is extended to the profession.

C. L. TOPLIFF, Secy.,
Decorah, Iowa.

## MISSISSIPPI DENTAL ASSOCIATION.

The Mississippi Dental Association has found it necessary to change the dates of its fourteenth annual meeting, to be held at County Court House, Meridian, from May 21, 22, 23, to 28, 29, and 30, 1907.

E. DOUGLAS HOOD, Secy.,
Tupelo, Miss.

## MICHIGAN STATE DENTAL ASSOCIATION.

The annual meeting of the Michigan State Dental Association will be held in Saginaw, June 6 and 7, 1907. All ethical practitioners are cordially invited to attend.

K. N. HOGARTH, Secy.,
Detroit, Mich.

## MISSOURI STATE DENTAL ASSOCIATION.

The next annual meeting of the Missouri State Dental Association will convene in Kansas City, Mo., June 4, 5, and 6, 1907. A most interesting and profitable meeting is anticipated. All ethical members of the profession are cordially invited to attend.

F. G. WORTHLEY, Pres., Kansas City.
E. P. DAMERON, Cor. Secy., St. Louis.

## IOWA STATE BOARD OF DENTAL EXAMINERS.

The Iowa State Board of Dental Examiners will hold its next meeting for examination at Iowa City, June 6, 7, 8, 10, 11, 1907.

To be eligible for this examination the applicant must hold a diploma from a college that is on the accredited list of the National Association of Dental Examiners.

Applicant must state where he attended first, second and third year of college.

Address all communications to

E. D. BROWER, Secy.,
Le Mars, Iowa.

## STATE OF CONNECTICUT DENTAL COMMISSIONERS.

The Dental Commissioners of the State of Connecticut will meet at Hartford, on Thursday, Friday and Saturday, June 13, 14, and 15, 1907, to examine applicants for license to practice dentistry, and for the transaction of any other business proper to come before said meeting.

All applicants should apply to the Recorder for proper blanks and rules for conducting the examination. Application blanks must be filled in and sworn to, and, with fee, filed with the Recorder on or before June 6, 1907.

By order of Commission.

GILBERT M. GRISWOLD, Recorder,
783 Main St., Hartford, Conn.

## FLORIDA STATE DENTAL SOCIETY.

The twenty-fourth annual meeting of the Florida State Dental Society will be held in the ball room of Hotel Continental at Atlantic Beach, Thursday, June 6, continuing in session three days. All ethical practitioners of dentistry are cordially invited to attend.

CARROLL H. FRINK, Cor. Secy.,
Fernandina, Fla.

## INDIANA STATE BOARD OF DENTAL EXAMINERS.

The next regular meeting of the Indiana State Board of Dental Examiners will be held in the Capitol at Indianapolis, June 11, 12 and 13, 1907. Applications for examination must be in the hands of the Secretary at least five days before the above date.

F. R. HENSHAW, Secy.,
Middletown, Ind.

## NATIONAL ASSOCIATION OF DENTAL FACULTIES.

The annual meeting of the National Association of Dental Faculties will be held in Minneapolis, Minn., commencing at 2 p. m. Friday, July 26, 1907.

The Executive Committee will meet at 10 a. m. the same day. The West Hotel has been selected as headquarters and place of meeting. Hotel rates as published in the notices of meeting of National Examiners will prevail.

H. B. TILESTON, Chairman Executive Committee.

## KANSAS STATE BOARD OF DENTAL EXAMINERS.

The Kansas State Board of Dental Examiners will hold their next meeting for examination in Topeka, May 22, 23, 24 and 25, 1907, at the Copeland Hotel annex. The examination fee is $25.00, with an additional fee of $5.00 for a license. Examination is not necessary for a graduate of a reputable dental school. The fee for registering a diploma is $25.00. Address all communications to

F. O. HETRICK, Secretary, Ottawa, Kan.

## NEW YORK STATE DENTAL SOCIETY.

The thirty-ninth annual meeting of the New York State Dental Society will be held at Hotel Ten Eyck, Albany, May 10 and 11, 1907. A program of reports and essays of unusual interest will be presented, and on Saturday afternoon a large number of special chair and table clinics will be given. A cordial invitation is extended to all reputable practitioners to attend the sessions.

A railway rate of a fare and one-third, on the certificate plan, for those attending the meeting will be secured.

Tickets at full fare for the going journey may be purchased within

three days previous to and during the first day of the meeting. Be sure, when purchasing ticket, to request a certificate.

On arrival at the meeting, present the certificate to the secretary, Dr. C. S. Butler, and 25 cents.

Tickets good returning not later than May 15.

Fraternally,

W. A. WHITE, President,
Phelps, N. Y.

CHAS. S. BUTLER, Secy,
Buffalo, N. Y.

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## AMERICAN MEDICAL ASSOCIATION, SECTION ON STOMATOLOGY.

The annual meeting of the Section on Stomatology, American Medical Association, will be held at Atlantic City, June 4-7, 1907, when the following program will be followed:

1. Chairman's address, M. I. Schamberg, New York City.

2. The Necessity of a Medical Education for Dentists, (a) from the Standpoint of the Lay Public, M. L. Rhein, New York City; H. C. Register, Philadelphia, Pa.; James McManus, Hartford, Conn. (b) From the Standpoint of the Physician, V. A. Latham, Chicago.

3. The Common Ground of Dentistry and Medicine, S. L. Fossume, New York City.

4. The Mutual Developmental Dependence of the Upper Air Tract, the Jaws, the Teeth, the Face and Their Economic Importance to the Human Race, W. Schier Bryant, New York City.

5. The Relation of Upper Respiratory Obstruction to Oral Deformity; Simultaneous Treatment by Expansion of the Dental Arch, Francis A. Faught, Philadelphia, Pa.

6. Speech Results of Cleft Palate Operations, George V. I. Brown, Milwaukee, Wis.

7. Technique of Lip and Palate Operations, Thomas Fillebrown, Boston, Mass.

8. False Statements Concerning Causes of Pathological Conditions, S. B. Luckie, Chester, Pa.

9. Acid Autointoxication, the Principal Cause of Erosion and Abrasion, Eugene S. Talbot, Chicago.

10. Some Results from Orthodontia on the Deciduous Teeth, E. A. Bogue, New York City.

11. Osteomyelitis of the Maxilla, Samuel L. Goldsmith, New York City.

12. A Case of Epidermoid Carcinoma of the Inferior Maxilla, W. H. Potter, Boston, Mass.

13. Pregnancy: A Factor in the Etiology of Dental Diseases, James E. Power, Providence, R. I.

14. The Dentist in the United States Navy, Richard Grady, Annapolis, Md.

15. The X-Ray an Aid to the Stomatologist, R. G. Richter, Milwaukee, Wis.

16. Radiography in Oral Surgery, with Demonstrations of a Focus Finder and Ray Localizer, G. E. Pfahler, Philadelphia, Pa.

M. I. SCHAMBERG, Chairman.
EUGENE S. TALBOT, Secretary.

## ILLINOIS STATE BOARD OF DENTAL EXAMINERS.

The next regular meeting of the Illinois State Board of Dental Examiners for the examination of applicants for a license to practice dentistry in the State of Illinois will be held in Chicago, at the Northwestern University Dental School, southeast corner of Lake and Dearborn streets, beginning Monday, June 3, 1907, at 9 a. m.

Applicants must be in possession of the following requirements in order to be eligible to take the examination: (1) Any person who has been engaged in the actual, legal and lawful practice of dentistry or dental surgery in some other state or country for five consecutive years just prior to application; or (2) is a graduate of and has a diploma from the faculty of a reputable dental college, school, or dental department of a reputable university; or (3) is a graduate of and has a diploma from the faculty of a reputable medical college or medical department of a reputable university, and possesses the necessary qualifications prescribed by the board.

Candidates will be furnished with proper blanks and such other information as is necessary on application to the secretary. All applications must be filed with the secretary five days prior to the date of examination. The examination fee is twenty ($20) dollars, with an additional fee of five ($5) dollars for a license.

Address all communications to

J. G. REID, D.D.S., Secretary,
1204 Trude Bldg., 67 Wabash Ave., Chicago, Ill.

## ILLINOIS STATE DENTAL SOCIETY.

The Illinois State Dental Society will hold its annual meeting at Quincy, May 14-17, 1907. The following program of essays has been arranged:

President's address, Elgin MaWhinney, Chicago.

Ethics, C. N. Johnson, Chicago.

Fillings versus Inlays, Don M. Gallie, Chicago.

The Dentist of To-morrow, J. W. Cormany, Mt. Carroll.

Some Features of Prosthetic Dentistry (illustrated by lantern), J. H. Prothero, Chicago.

Extracting, M. W. Olson, Galesburg.

Dental Research Work, C. R. Lawrence, Bethany.

Brief Review of the Chemistry of Pulp Decomposition, with a Rational Treatment for This Condition and Its Sequelæ, J. P. Buckley, Chicago.

Cement Lining as Anchorage, C. C. Corbett, Edwardsville.

The Last Twenty-five Years of Dentistry, E. H. Allen, Freeport.
The Limitations of Dental Education, G. V. Black, Chicago.
Some Common Mistakes in Orthodontia, Lloyd S. Lourie, Chicago.

Two sessions will be devoted to clinics, and a splendid variety of both chair and table clinics has been arranged. One half day will be spent in a steamboat ride on the Mississippi River, and arrangements have been made for the members to visit the Soldiers' and Sailors' Home, and many other places of interest at Quincy.

ARTHUR D. BLACK, Secy.,
31 Washington St., Chicago.

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## LATEST DENTAL PATENTS.

384098. Design, Dental cabinet, Harry C. Cowran, Two Rivers, Wis.
38,409. Design, Dental cabinet, Harry C. Cowran, Two Rivers, Wis.
839,920. Magnesia-cement composition, Wm. L. Dudley, Nashville, Tenn.
840,348. Specialists' chair, Charles N. Leonard, Indianapolis, Ind.
840,921. Dental swage, Joseph W. Dickey, St. Louis, Mo.
841,006. Apparatus for the manufacture of reducing amalgam, Herbert P. Ewell, Rochester, Mich.
841,946. Toothbrush, Fred Downing, Decatur, Ill.
841,962. Dental flask-press, James F. Hardy, New York, N. Y.
842,112. Dental plugger, Safford G. Perry, New York, N. Y.
842,357. Filling teeth, Hamilton F. Strong, Cleveland, Ohio.
843,273. Dental bur and excavator, Willy Homann, Dusseldorf, Germany.
844,079. Dental matrix, Ellsworth Armstrong, Collingdale, Pa.
844,181. Dental floss holder, Charles M. Overbaugh, Clarion, Iowa.
846,738. Dentifrice, Frank P. Barnard, Worcester, Mass.

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# News Summary.

DR. W. H. ROPER of Reedsburg, Wis., died recently.

DR. JOHN X. SKELLY of Chicago, Ill., died on March 26, 1907.

DR. N. J. M'GREW of Hamilton, Ohio, died on March 2, 1907.

DR. JAMES R. FOSTER of LaCrosse, Wis., died on March 3, 1907.

DR. GEORGE M. O'HARA of Springfield, Ill., died on March 23, 1907.

DR. WILLIAM B. WISE of Broad Creek, Va., died on March 4, 1907.

DR. EDWARD PARKER ELSON of Canton, Ohio, died on March 3, 1907.

DR. EUGENE J. HAUSLE of Buffalo, N. Y., died on March 12, 1907.

DR. J. BARKER VOSBERG of Montreal, Canada, died on March 7, 1907.

DR. KENYON B. DAVIS, aged 71, died on March 1, 1907, in Springfield, Ill.

DR. JOHN W. HUNTZBERY of Hagerstown, Md., died on March 8, 1907, of tuberculosis.

Dr. Isaac Strickland, aged 76, died at his home in Bangor, Me., on March 21, 1907.

Dr. John A. Lee of Chattanooga, Tenn., was found dead in his room on March 4, 1907.

Dr. A. H. Dreher of Salisbury, N. C., aged 38, died on March 11, 1907, in a Philadelphia hospital.

Dr. D. J. Phillips of Indianapolis, Ind., died on Feb. 26, 1907. He had been an invalid for eight years.

Dr. George H. Gidney died at his home in New Haven, Conn., on March 5, 1907, after a two weeks' illness with diabetes.

Dr. James Goodwillie of New York died on March 4, 1907, after a three days' illness, with pneumonia. He was 71 years old.

Dr. Otis C. White, aged 70, died at his home in Worcester, Mass., on March 11, 1907, after an illness of four weeks, with cancer of the liver.

Dr. William H. Cooke died at his home in Clarendon, Tex., on March 17, 1907, after an illness of five days, with la grippe. He was 75 years old.

Dr. John S. Thompson of Atlanta, Ga., died on March 12, 1907. He was one of the founders of the Dental Department of the Southern Medical College and a professor in it for many years.

Dentist Commits Suicide.—Dr. F. S. Langdon of Chicago committed suicide in Clermont, Wyo., on March 1, by cutting his throat with a razor.

Dentist Chosen Postmaster.—Dr. Adolph Aronheim, a young dentist of Norfolk, Va., has been made assistant postmaster of that place.

Dentist Disappears.—A dentist of Bethlehem, Pa., has disappeared, leaving a note for his father, telling him to take the property in his office.

Is This True?—According to newspaper report, Sampson Eastep of Fort Smith, Ark., is cutting a new tooth, and, as he is 74 years old, is prouder of it than any tooth he ever had.

New Building for Minnesota.—The regents of the State University of Minnesota have asked for an appropriation of $100,000 for colleges of dentistry and pharmacy.—*Am. Dent. Journal.*

A Commendable Offer.—Dr. Sedley Raylor of Cambridge, England, has offered to defray the cost, up to $2,500, for a year's attention to the teeth of children attending the schools of his town.

Died from Shock of Teeth Extraction.—George Michaels, aged 51, a cigarmaker in Oneida, N. Y., died from shock due to extraction of eleven teeth, according to the Buffalo (N. Y.) *Courier.—Am. Dent. Journal.*

To Prevent Expansion of Plaster in Setting.—If slaked lime is added to boiling water and the clear water decanted for use in mixing plaster of Paris, the plaster will not expand.—P. B. McCullough, *Dental Brief.*

Dental Company Failure.—The Golden Crown Dental Company of Peoria, through its proprietor, C. C. Manning, has filed a petition in bankruptcy. The liabilities are given as $3,105.68, with assets of only $350.

BILL AFFECTING DENTISTS.—A bill has been introduced in the Tennessee legislature, for the regulation of the laws governing the practice of dentistry and making the rules more stringent and the standard higher than in the past.

DEATH OF DENTISTS.—Duluth, Minn., is sending out an invitation to dentists. A paper of March 22 of that city has a scare head "Dentists Are Scarce" and tells of the removal of a number of dentists within a short time.

BOY REGAINS SPEECH.—Joseph Loder, a twelve-year-old boy of Terre Haute, Ind., is said to have regained his power of speech after eight months of being dumb. He coughed up a broken tooth a few days ago and at once began to talk.

A DECEIVING DENTIST.—A dentist formerly practicing in Peoria has departed for parts unknown, leaving a number of debts, large and small, behind him. A warrant is out for his arrest on the charge of obtaining goods under false pretenses.

FIFTY YEARS A DENTIST.—The fiftieth anniversary of his entrance into the profession of dentistry was observed by Dr. Henry A. Smith of Cincinnati on March 6, 1907. Twenty-four dentists of his city gave a banquet in his honor on that evening.

SCHOOLS SEPARATE.—The affiliation between the University of Cincinnati and the Ohio Dental College has been severed at the request of Dr. H. A. Smith, dean of the dental school, who urged as his reason that neither institution was deriving benefit from the connection.

FIRES.—A. C. Clark & Co., a dental supply firm of Chicago, suffered a loss of $1,000 in a fire on March 17.—The office of Dr. A. M. Wilkes of LeRoy, Ill., was destroyed by fire on March 1.—Dr. George W. Davidson of Sumarall, Miss., lost about $300 in a fire on March 17.

DENIED ANOTHER TRIAL.—A motion for a new trial for Dr. E. B. McCoy, under conviction for the murder of his wife in Independence, Kan., was overruled by Judge Flannelly of the district court on March 15. Mrs. McCoy died in June, 1906, and the defense claimed she committed suicide.

TO REDUCE THE PAIN INCIDENT TO THE REMOVAL OF CALCULI.—For the purpose of reducing the pain incident to scaling, I recommend packing the pocket with a rope of cotton saturated in a one per cent, cocain-adrenalin solution and allow it to remain five minutes.—ELGIN MAWHINNEY, *American Dental Journal.*

INLAYS FOR ANCHORING BRIDGES.—There is no longer any necessity of extending the margin of a crown beneath the gum margin of bicuspids and molars. The substitute I would offer for the old method is a crown inset into the substance of the tooth, the gold margin of which is flush with the tooth's surface. The normal anatomical formation of bicuspids and molars constitutes a natural and most serious bar to the perfect fitting of a band. An examination of typical tooth forms gives instant conviction of the irrationality and impossibility of attempting accurate and scientific coaptation

at the tooth's neck, at once the most important and vulnerable point. It is all too evident that the almost universal custom of procedure is based on wrong mechanical principles and produces unhygienic, unsanitary and disease-engendering conditions.—JOSEPH W. WASSALL, *Dental Review.*

SENSITIVE CERVICAL MARGINS.—If bicarbonate of soda is incorporated in the tooth powder used by the patient, sensitiveness will be relieved and he will be enabled to thoroughly masticate, bringing about a normal condition of the saliva and the alkaline powder will not be long required.—D. SPALDING, *Dental Register.*

ACCIDENTS.—J. W. Johnston, a dental student of Braddock, Pa., fell four flights down an elevator shaft and suffered nothing worse than a few bruises.—Dr. Adolph Olson of Duluth, Minn., had a narrow escape from death on March 11, when his vulcanizer exploded. He was severely injured and it is feared never will regain the sight of his left eye.

STERILIZATION OF DENTURES.—Sulfurous acid will absolutely deodorize and disinfect a denture and not merely cover the odor of a plate that has been worn in the mouth. Place a few drops in a little water and immerse the case in the solution at night and cleanse with soap and brush in the morning. —J. KENNERLY, *British Dental Journal* (*Western Dental Journal*).

WANT DENTAL RESTRICTIONS.—The dentists of Oklahoma and Indian Territory are making efforts to secure the passage of bills regulating the practice of the profession in the two territories. In Indian Territory there are no restrictions whatever, and, as a result, the dentists say any kind of a quack can practice and hurt the business and standing of the regular dentists.

EXTRACTION OF THIRD MOLARS.—There is one condition wherein it is not well to extract the third molars, viz., when the added diameters of the teeth do not equal the space in the jaw allotted to the teeth and therefore they have a tendency to separate. Such teeth are not apt to decay much, and the third molars may help to hold them in their original positions.—DR. HORACE WARREN, *Dental Summary.*

NOVOCAIN.—The especial advantages of novocain are found in the extremely slight toxicity, combined with great anesthetic power, and the absence of all irritating or pain-producing side action. In 10 per cent solution it may be used as an application to mucous membrane and is especially recommended for use in dental work. It is frequently combined with suprarenal preparations.—*New Orleans Medical and Surgical Journal* (*Dental Brief*).

LITTLE HELPS. When polishing posterior fillings, to avoid scratching the mirror, and to keep tongue and check away while doing the work, I find nothing better than a medium size teaspoon. Insert it always with the concave side toward the surface to be polished, and you will find with what ease the work can be accomplished, and will be surprised at almost complete shutting out of saliva.

After temporary stopping has been inserted in an approximal cavity, take

a fine polishing strip, moisten it with eucalyptus oil, and pass it into the embrasure to and fro several times. The filling will become smooth and a better retention will be secured.

A few drops of compound tincture of benzoin rubbed on the hand will prevent the forceps handles from slipping, which they do many times on sultry and muggy days.—GEORGE ZEDERBAUM, *Dental Register.*

TO BEAT THE DEADBEATS.—From three western states, comes word of the dentists uniting to protect themselves from the thoughtless ones who have their dental work done and then forget to pay the bills. In Fond du Lac, Wis., and Cedar Rapids, Iowa, the dentists have united, while in Danville, Ill., the physicians have joined with the dentists in an effort to protect themselves from bad bills.

GUTTAPERCHA FOR MOUNTING BRIDGEWORK.—The use of guttapercha for mounting fixed bridgework is becoming more and more general in proportion as its advantages are recognized and its manipulation mastered, the advantage offered lying mainly in the comparative ease with which the bridge may be removed in the event of necessity and without injury to the abutments.—H. J. GOSLEE, *Items of Interest.*

SWALLOWED TEETH.—While eating his breakfast, Hugo Herfurth, Jr., a car builder of Alexandria, swallowed three artificial teeth and the plate to which they were attached. They lodged in the young man's throat and after efforts had been made to dislodge them he was taken to a Washington hospital, where it was found necessary to make an incision in his throat before they could be removed.—*Am. Dent. Journal.*

ETCHING PORCELAIN INLAYS.—Hydrofluoric acid makes a smooth etch; white acid makes a frosted etch, to which the cement will tightly adhere. It is prepared by making a saturated solution of ammonium carbonate in hydrofluoric acid, using a lead dish; evaporate to one-half its bulk; add hydrofluoric acid up to original bulk, and evaporate again to one-half. Keep it in a guttapercha bottle.—JOSEPH HEAD, *Dental Cosmos.*

DO NOT VARNISH INLAYS AFTER SETTING.—The varnishing of an inlay after setting for the purpose of keeping the moisture from the cement has proved incorrect. The cements that are used to-day in setting inlays are what are called hydraulic cements. We have better success with such cements, for after a proper crystallization has taken place the moisture is immediately allowed to flow over.—W. H. CUDWORTH, *Dental Brief.*

A LIQUID PREPARATION OF IODOFORM.—M. Blanchi has published a formula for the preparation of iodoform in a liquid state which from a therapeutical point of view offers certain advantages over an emulsion of iodoform. It is a syrupy, yellowish liquid, having an odor of iodoform, and is miscible with water, alcohol, ether, glycerin, chloroform, essential oils, benzol, eucalyptol and creasote. It dissolves guaiacol and several other drugs, and is easily absorbed through the skin, iodin having been found in the urine six hours after the application of the liquid. It is easily prepared by dissolving 35 parts of caustic potash in 25 parts of water, adding first 50

parts of oleic acid and 30 parts of 95 per cent. alcohol, and then 30 parts of iodin in small portions. On warming the mixture, iodin is absorbed, and a brownish liquid is obtained. If necessary, the brown tint may be destroyed by the addition of a few drops of caustic potash. After a few days the liquid is decanted and kept in a dark place.—*Lancet* (*Dental Cosmos*).

DIVORCES.—On March 2, Mrs. Florence Rice Estabrook of Lexington, Mass., filed a bill for separate maintenance against her husband, Dr. Charles E. Estabrook, a dentist of Everett, Mass.—Mrs. Carolyn Gates of St. Louis, Mo., was granted a divorce from her husband, Dr. Franklin C. Gates, on March 11.—Mrs. Louise V. Fosdick of Laporte, Ind., filed a bill for divorce from her husband, Dr. William Fosdick, on March 27.

SALIVATION.—Potassium chlorate, 55 per cent, is better for the mouth where mercury has been used than anything I know. It counteracts the action of germs, will heal up ulcerations and prevent salivation. We meet this condition right along, and possibly 50 per cent. of the dentists treat it as pyorrhea. Mercury assists in filling the mouth full of germs, and for this particular condition chlorate of potash will assist us materially.—I. M. ROSENTHAL, *Dental Summary.*

FLUX FOR SOFT SOLDERING.—Pieces of zinc are dissolved in hydrochloric acid until the acid is saturated. The resultant solution of zinc chlorid is mixed with an equal amount of a mixture consisting of aqua ammonia and alcohol. After standing a few days the solution is filtered and ready for use. The so-called Miller's soldering fluid consists of a solution of phosphoric acid in eight parts of water to which one part of lactic acid and glycerin have been added.—*Dental Era.*

STRENGTH OF TINCTURE OF ACONITE.—The most important change in the strength of tinctures is that of Tinctura Aconiti. This preparation in the U. S. P. of 1890 was directed to be 35 per cent. In the U. S. P. of 1900 it has been reduced to 10 per cent. It is well to keep this change in mind, for tincture of aconite is an important constituent in liniments used in the local treatment of many diseased dental conditions, especially pericementitis and facial neuralgia.—J. P. BUCKLEY, *Dentist's Magazine.*

LAWSUITS.—Dr. Lee K. Stewart of Chicago, who sued a vice-consul of that city for $228 for non-payment of a dentist's bill, was given judgment for that sum.—Dr. Homer Templeton of Elwood, Ind., sued a man for $6,000, which he had paid for a farm which he claimed had been misrepresented to him. The case was on trial for months and went to courts in several counties, only to be dismissed at last.—A dentist of Baltimore, Md., has been ordered by the courts to pay a young woman $424. She sued him for $400, which she claimed she had lent him on the strength of his promising to marry her. The additional $24 allowed her was interest on the original amount.—Clarence M. Rankine of Pasadena, Cal., is suing a dental firm of that place for a share of the profits of the office. He claims that he sold his practice in Chicago and went to California to enter into partnership with the dentists named in the bill, with the assurance

that he could secure a temporary license to practice pending his examination before the dental board next June. Finding this impossible, he hired an assistant, who turned over his earnings to the firm rather than to Rankine. —Dr. Frederick Osius of Muskegon, Mich., has secured an injunction against a dentist from opening an office in that city in opposition to an agreement said to have been entered into that he should not do so.

NEUROCAINE.—I have found the preparation called "Neurocaine" most useful. It is pure cocain hydrochlorate in little pellets one-eighth inch long, weighing 1-12th gr. Its chief advantage is its easy solubility. One of these pellets, or a portion of one, can be taken up in the dressing forceps and placed exactly over the exposure and moistened with a very small quantity of adrenalin-chlorid; in a few seconds you have a concentrated solution ready for pressure.—J. A. FOTHERGILL, *British Dental Journal.*

ORTHODONTIA: PHOTOGRAPHS.—I would urge you to take photographs of each case. One practical reason for this is that after a long course of treatment, during which a child's features have been altered very gradually, parents are apt to forget the initial condition and fail to appreciate the magnitude of the change which has been effected. Casts do not appeal to them as does a photograph, as they show only the teeth and not the appearance of the patient.—J. D. BADCOCK, *British Dental Journal* (*Dental Brief*).

ILLEGAL PRACTITIONERS.—A Chicago dentist was fined $75 and costs by Municipal Judge Scovel on March 7, for practicing without a license.—A Providence, R. I., dentist was arrested on March 13 on the charge of practicing dentistry without a license. He pleaded not guilty, and his case was continued. On its calling, his prayer for a writ of mandamus against the dental board was denied, and the judge ruled he would have to take the prescribed examination before he could practice legally.

SELECTING TEETH FOR DENTURES.—I have two classes of individuals for whom I select colors—the brunette and the blonde. The brunette always has a blue-white tooth, and the blonde a yellow-white tooth—extremely so. You can confirm this with your shade guides when these types of individuals appear in your office. In patients who are neither brunettes nor blondes you will find that one type or the other is predominating, and you can grade the shades according to the predominating type.—E. J. PERRY, *Dental Review.*

A COMBINATION GOLD AND PORCELAIN INLAY.—Get a perfect model and burnish 1-2000 platinum to fit same. Mix enough moldable porcelain (to the consistency of putty) to give you about the contour wanted, leaving enough room in surface for a layer of Watts' crystal gold, which is anchored in the porcelain by pits drilled after it is set. Anneal gold and with light hand pressure fill pits and build out to contour desired. Take out of model after you are sure the platinum is burnished to margins, paint cavity surface and platinum to the margins of the gold with fine powdered rouge dissolved in alcohol to keep solder from flowing where not desired. Place inlay on asbestos pad, heat up slowly and flow 22k.

solder into the Watts' crystal gold. Cover with asbestos so piece will cool slowly. You will find when inlay is cool that you have a perfectly fused porcelain inlay covered with a thin veneer of gold. This is only practicable with large restorations and the claims for it are: You have the porcelain to protect the pulp from thermal changes and a surface to which the cement will adhere; the gold can be burnished to make a perfect margin and we have a great saving of gold.—G. S. HERSHEY, *Dental Review.*

REMOVAL OF ADENOIDS.—The operation should not be performed if virulent septic infection of the pharnyx or adjacent cavities already exists. In cases of middle ear suppuraion where adenoids are present for some weeks before operating for the removal of the adenoids use the following ear-drops: Biniodide of mercury in dilute alcohol (Hydrarg. Iod. Rub., gr. ⅛ to ½; Potass. Iod., gr. ½; Alcohol, drms. 4, and water, drms. 4), or zinc chlorid in dilute alcohol (Zinc Chlor., grs. 4; Glycerin, drms. 2; Alcohol, drms. 2 to 4; water to an ounce).—*Dental Era.*

EXTRACTION IN ORTHODONTIA.—Extraction has no place in modern orthodontia. We do not even admit of rare exceptions as was done by us a few years ago. The loss of teeth makes the treatment of these cases more difficult and a failure from the standpoint of occlusion and facial balance—because the arches are so constructed that the removal of one tooth ruins the possibility of that mutual support which each tooth renders to its neighbor and to the entire denture, which under conditions of normal occlusion always exists.—WILLIAM G. LAW, Berlin, Germany.—*Dental Review.*

SILVER NITRATE: PRECAUTION.—After cleansing the teeth and in all infectious conditions of the gums and oral cavity I use very frequently a 10 per cent silver nitrate solution, applied on a small swab. To prevent and neutralize the escharotic effects I first apply tincture of iodin liberally over the gums and about the teeth (but not in the cavities, as the teeth would discolor). I also follow the silver nitrate with more iodin, which prevents any free silver nitrate remaining. The surplus of tincture of iodin is quickly washed out and is only irritating.—OTTO HOLLINGER, *Dental Review.*

ROBBERIES.—Burglars entered the office of Dr. Cross and Dr. Williams of Chickasha, I. T., on March 21, and stole $50 worth of gold plate.—Tools and gold filling, valued at $200, were stolen from the dental office of Dr. D. D. Griffin and Dr. W. W. Westmoreland of Columbus, Miss., on March 2.—The offices of the Philadelphia Dental Parlors of Mobile, Ala., were entered on March 3, and $75 worth of gold filling stolen.—Mrs. Annie Cummings of Chicago has been sentenced to six months in the bridewell for robbing Dr. Frank R. Swenk of $155. John Murphy and his wife were sentenced for the same period on the charge that they had received part of the money.—Dr. A. L. Murphy of Independence, Mo., had $75 worth of gold and other supplies stolen from his office on March 7.—Gold leaf to the value of $50 was stolen from the office of Dr. S. H. Kirsch of York, Pa., on March 7.—Dr. M. A. Becker had $150 worth of gold stolen from his office in Reading, Pa., and Dr. J. Frank Stevens had instruments and supplies stolen from him.—A well-dressed man was

arrested in the office of Dr. J. H. Craven of Hamilton, Ohio, on March 17. He had said he had an appointment to meet his sister, and, when left alone, proceeded to ransack the cabinet in the office.—Burglars made a raid on dental offices in Allentown, Pa., on March 23, securing gold leaf from the offices of Dr. C. S. Miller, Dr. George J. DeLong and Dr. C. A. Hering. Each dentist lost about $20 worth.—The offices of Drs. Boyd and Boyd and Dr. C. B. Gunn of Leavenworth, Kan., were entered on March 10 and about $75 worth of gold and platinum was stolen.

ORIGIN OF "DOCTOR."—The term "doctor" was invented in the twelfth century, about the time of the first establishment of universities. The first person upon whom this title was conferred was Irnerius, a professor of law at Bologna University. The title was created by Emperor Lothair II, but was suggested by Irnerius himself. The term extended to the faculty of theology, and was first given by the University of Paris to Peter Lombard, the famous theologian. In 1329 the College of Asti conferred the first title of doctor of medicine upon William Gordenio.—*Medical Fortnightly (Dental Cosmos)*.

DENTISTS IN COURT.—A Chicago dentist was fined $1 and costs in the court of Municipal Judge Fake on March 26, for disorderly conduct, the complainant claiming he had called him a "deadbeat" in such loud tones as to cause a disturbance.—A traveling dentist of Minnesota is in trouble, having been arrested at Olivia for the alleged passing of counterfeit money. —A dentist of New Bedford, Mass., is under arrest, charged with having violated the postal laws by sending first class mail under fourth class postage.—A Greensburg, Pa., dentist has been arrested on the complaint of his wife, who charges desertion.

PREVENTIVE TREATMENT IN ORTHODONTIC PRACTICE.—At four or five years of age you can very often see that you will have malocclusion; why not take steps to prevent it? It is better to have the teeth erupt in their proper position than to push, pull or shove them into position after they have taken an abnormal one. If at four and a half or five years there are no spaces between the anterior teeth there will not be room for the permanent incisors. A little stimulation at that age, simply in the lower arch, will widen both the lower and the upper if the upper teeth have well-defined cusps.—I. LOWE YOUNG, *Dental Cosmos*.

CUSPS FOR BRIDGE TEETH.—Another method of forming cusps on bridge-teeth other than swaging in gold plate, and which I consider much stronger than the latter, is the following: Having the gold crowns on an articulator, grind the facings, and back them with pure gold, as usual flowing a "starter" on the occlusal tip to insure perfect results; after filing the pins more than half in two, and bending over firmly, burnishing a last time to insure perfect adaptation, wax the facing *in situ*, forming all the occluding cusps, and while the wax—Parr's hard wax flux is excellent for waxing all cases to be soldered—is still soft, bring the occluding teeth down into the wax in the normal bite position; trim the cusps up, as you would for a seam crown, invest—I find three parts yellow ochre and two parts model

plaster very good as an investing material, with no hazardous effects—and heat well, being sure to get the case sufficiently hot, and flow your 18k. or 20k. solder right into the cusps formed. If properly heated, a few touches with a small carborundum stone will give you pleasing results and a firm, substantial piece of work, with no air space between the solder and swaged cusps. I find it is always better to leave quite a heavy cusp to take the strain in lieu of the facing. For final polishing of crowns and bridgework I have found nothing more satisfactory than electro-silicon.—SYDNEY A. SMITH, *Pacific Dental Gazette.*

TO PREVENT VACANT SPACES IN VULCANIZED RUBBER.—The expansion of rubber by heat between 200 and 320 degrees is a very close approximation to its shrinkage in vulcanizing, therefore if, after the flask is closed by boiling it, the bolts are slackened so that the flasks will part easily under the pressure caused by the expansion of the rubber as it is heated to the vulcanizing point, all the rubber which was in the mold when it was closed can be retained therein. Then, if spring pressure is applied and the flask closed after shrinkage has practically ceased, the rubber will, at the end of the vulcanizing process, remain closely applied to the teeth and the surfaces of the mold.—GEORGE B. SNOW, *Dental Brief.*

APPLY THE FORCEPS CAREFULLY AND THUS AVOID SERIOUS MISHAPS.—One of the errors most frequently made is hastening to apply the forceps as soon as the tooth or root has been condemned to extraction, without making sufficiently careful examination of the case. The fracture of teeth or roots often results from the too hasty and inconsiderate application of force—a mishap that may be avoided by first making a thorough study of the case. Frequently too much force is applied, or too much cutting of the alveolar process, when a testing of the solidity of the root before applying the forceps would have revealed its weakness and perhaps have led to a different method altogether—possibly the elevator instead of the forceps. The careless operator has often felt shame for the heroic bite he has taken with the alveolar forceps to extract a contemptible little stump that he could easily have overturned with the elevator.—*Dental Cosmos.*

CONTROLLING A HYPERSENSITIVE PALATE WHEN TAKING IMPRESSIONS.—A gentleman, about sixty years of age, called at my office, claiming that he had been unable to get a set of teeth because no dentist had been able to get the impressions, his throat and palate being so sensitive. The last dentist he had visited, after trying cocain as a spray, and various other methods, told him to go home and tickle his throat with a long feather. This he did, with the result that his stomach and nervous system were in a very bad condition when he applied to me. I was once advised by a physician to use chloretone in such cases. After giving the man the following doses of chloretone, I was enabled to take my impressions with no unpleasant symptoms whatever. I gave him three powders of chloretone, each containing five grains, and directed him to take them as follows: Upon getting up in the morning he was to take one powder; two hours thereafter another, and eat a very light breakfast, after which he was

to take the last powder, and report to me. When he arrived at my office I gave him a very small dose of chloretone—say two grains—and proceeded to take my impressions, as I have stated, without the least trouble. The man will sing my praises for doing what so many failed to do, and which they could have done had they only used chloretone. To any one who may ask, I would be glad to recount my experiences in other cases in which I have used this most important compound.—A. E. FRANKLIN, *Dental Register.*

TREATMENT FOR SENSITIVE CAVITIES.—I have frequently been surprised at the results obtained from sealing in a sensitive cavity a preparation of equal parts of oil of cloves and carbolic acid, to which has been added twenty grains of cocain to the ounce. I have found many times that after this preparation has been in the tooth for 24 hours, I have been able to prepare extremely sensitive cavities without causing any pain whatever. I do not claim that this will answer in all cases, nor that it is a method to be relied upon to any great extent, but I do know that it is well worthy of consideration, and one which, if followed, will make all cavities less sensitive for exploring purposes.—W. G. E., *Dentist's Magazine.*

REPLACING A FACING.—In repairing a facing on a bridge or crown the success of your operation depends greatly on the adaptation of the new facing to the old backing. This depends on getting your holes drilled in the right place and grinding the facing to fit. This can be very simply done by taking a pellet of cotton, saturating with alcohol, then rubbing it over a blue or black ink-pad such as used for rubber stamps. Make a coating over the backing and press the facing to position. The ink will mark the place where it is necessary to grind. Wash thoroughly after facing is adapted and set with a slow setting cement. The pins may be secured by means of the Bryant system or by riveting.—C. J. HADLEY, *Dental Review.*

BAD TEETH CAUSE REJECTION OF MANY ARMY RECRUITS.—During 1904, of over 244,425 European officers and men of the British army serving at home and abroad, more than half (159,644) were admitted to the hospital, 1,592 died, and 4,778 were discharged from the service on account of disease and injuries. The respective rates were considerably below those of the previous year and also of the average rates for the ten years 1894-1903. The decrease, a blue-book just issued states, was noticeable in all arms of the service. It is curious to note the following variations: The highest rate of admission to hospitals was in the Foot Guards (768 per 1,000), the Household Cavalry coming next; the mortality was highest in the regimental depots (52 per 1,000), and lowest in the Household Cavalry and Foot Guards; the invaliding rate was highest in the Infantry (33.62 per 1,000), the Foot Guards coming next; and constant inefficiency was highest in the latter (58.92 per 1,000), the Cavalry coming next.

Great attention is of course paid to the soldiers' teeth; 6,214 men had their teeth filled or otherwise treated, while 4,746 men had 7,604 teeth drawn; of that number 456 were extracted under anesthetics.

During the year 70,346 recruits were inspected, and 23,790, or one-

third of the number, were rejected as unfit. Compared with the previous year, the ratio of rejection increased by 1.5 per cent. The ratio was highest in the recruits from England and Wales, and lowest in those from Ireland; it was, however, much lower still in recruits from the colonies. About 5,000 were rejected for loss or decay of teeth, 3,600 for being under the chest measurement, and 2,500 for defective vision.—*Dental Surgeon.*

IODIN AS A GERMICIDE. In a solution of iodin varying from 0.2 to 1 per cent, we have a very potent germicidal agent, far superior to mercury bichlorid—the acknowledged leader of all other antiseptics. It approaches nearly to the ideal antiseptic in that (a) it is easily prepared and is stable; (b) is non-toxic and non-irritating, in the strength effective, being only one-fourth as toxic as mercury bichlorid; (c) it does not coagulate albumin or form inert compounds with tissues; (d) it is effective in a very brief time; (e) the stain it produces soon disappears; (f) last and most important, it possesses a remarkable penetrating power. A 0.5 per cent. solution is amply strong for all practical purposes.—*St. Louis Medical Review* (*Dental Cosmos*).

MARRIAGES.—Dr. J. G. Walton of Cincinnati and Miss Maud Redding were married on March 9, 1907, at the home of the bride in Glasgow, Ky.—Dr. F. C. Ehrhardt of Piper City, Ill., and Miss Bessie Arnold were married at the bride's home in Kangley, Ill., on March 13, 1907.—Dr. Emmet Hallock and Miss Jennie Lindauer, both of Kaukauna, Wis., were married on March 3, 1907.—Dr. William A. Hermann of Los Angeles, Cal., and Miss Birdie Penn of Camden, Ind., were married on March 10, 1907.—Dr. Frank J. Buchanan and Miss Florence C. Snagg of Waterbury, Conn., were married on March 8, 1907.—Dr. W. M. Edgar and Miss Lilian Ormsby of Chicago surprised their friends by eloping and marrying on March 20, 1907.

KNOCKING.—Habit is everything, the growth of habit is rapid, whether it be the consumption of whiskey, the burning of tobacco, the attendance at church, or the pernicious habit of knocking, and when one's system becomes accustomed to the easy criticism of others' characters the habit expands and grows to an alarming degree. It has become almost an epidemic, in dental circles, to knock, not hitting the enemy alone, but friends as well. The late unpleasantness in the National was largely due to this habit, unkind remarks regarding the actions or personality of some friend, not made with any special evil intent, but simply because one's liver was not working, or a subject of conversation was needed, and it was easier to pick out the flaws of our friends than to seek for their virtues. The men we knocked are prominent. They became so because in some branch of dentistry, either as writers, teachers or executive managers they had made good, so as soon as they are high enough on the pedestal for the limelight to shine on them, out come our large and small hammers, and we try to knock the pedestal base away. Why should they shine and we be in the shadows? We could have done the things they did, but we didn't,

so altogether now—knock. Why not follow the belief of Carlyle, who said: "I am a firm believer in the maxim that for all right judgment of any man it is useful, nay essential, to see his good qualities before pronouncing on his bad."—J. P. Root, *Western Dental Journal.*

Compromise with Executors of the Evans Estate.—The compromise offered to the board of trustees of the Thomas W. Evans Dental Institute and Museum by the executors of the estate has been accepted by Mayor Weaver of Philadelphia, and everything is in readiness for the settlement.

The compromise, which the mayor has decided is a proper one, includes among other agreements one which permits the executors to pay all of their own expenses out of the fund in Paris as well as those of the estate, and to pay the legacies and all taxes and obligations of every account against the estate in France. This leaves the New York and Pennsylvania assets for the Thomas W. Evans Museum and Institute Society free of all deductions, except an allowance of $75,000 toward counsel fees of the executors and other expenses connected with the estate in this country. The properties and assets of the estate in this country foot up to an assessed value of $912,000.

The mayor states that under the terms of the settlement he believes that after all legal expenses are paid this net residue will be about $750,000. It is the purpose of the trustees to dispose of the real estate in New York at the earliest advantageous moment and with the proceeds immediately to begin the erection of the museum, as provided for by the Evans will.—*Philadelphia Record* (*Dental Brief*).

The Mixing of Amalgam.—I have much fault to find with the prevailing method of amalgamating alloys. If we are to start out with a homogeneous alloy we should wind up with a homogeneous amalgam. The very best grades of modern alloys do not combine readily with mercury, and even after the combination of the metals has been effected there remains within the mass a large surplus of mercury, including a fair percentage of particles of alloy which have not succumbed to the action of the mercury. During the process of wafering the amalgam, also including its insertion in the cavity, there remains in the amalgamated mass a large percentage of free mercury, together with a lesser proportion of unamalgamated alloy; and so in time two evils are bound to develop in the way of shrinkage and lack of permanence of form. The shrinkage is due to the surplus of mercury, while the slight change of form is the result of particles of alloy acting upon the free mercury, thus causing a change in the crystalline structure of the amalgam. The only remedy we have for such trouble is to spend more time in mixing the alloy; such as triturating it with a faint surplus of mercury and removing the surplus of that metal by using gentle pressure. Return the mass to the mortar or the palm of the hand and work it vigorously until it has re-softened. Wafer again, and continue the kneading and wafering process until, all told, four operations have been performed. You will be surprised to find how much more mercury will be removed from the mass when working your alloy

in this manner. You will also succeed in producing a homogeneous amalgam, with the exception of a certain percentage of free mercury, that can only be removed as the amalgam is inserted in the cavity. When the mass of amalgam is large the final wafering process should be performed by dividing it into several portions and wafering each one separately.

The success attained in producing a good mix does not depend upon the amount of mercury that you use so much as upon the amount th you succeed in removing from the mass.—N. K. GARHART, *Dental Era.*

THE MIXING OF ZINC OXYPHOSPHATE CEMENT.—The problem of mixing a zinc oxyphosphate cement is one which must be largely worked out by the individual operator. One cognizant of the proper feel of the cement beneath the spatula is in position to get good results. In a general way, some points of value can be given. Most often cement does not receive enough of careful spatulation, yet it can be utterly ruined by over-spatulation. Too little spatulation gives a quick-setting, granular result, and over-spatulation gives cement which will never properly crystallize. Thus it can be seen that these features must be kept in mind, and that the operator must become familiar with the proper feel of the cement beneath the spatula.—W. V. B. AMES, *Dental Era.*

THE STRENGTH OF SURGICAL SUTURES.—M. A. Astruc has in the *Journal de Pharmacie et de Chimie* an interesting article on the determination of the strength and other physical characters of catgut, silk, and other surgical sutures; this is of particular importance in Dental and Oral Surgery. M. Astruc points out that sutures as employed by surgeons are not submitted simply to direct tension, the knots having to be taken into account. The breaking strain is not the same in the case of a simple thread as it is when a knot is present. Hence, M. Astruc has determined this for both simple and knotted sutures. The following table gives a few of these figures:

BREAKING STRAIN (IN KILOGRAMMES).

| Size of Sutures. | Simple Suture. | Suture Containing a Surgeon's Knot. | Suture Containing a Simple Knot. |
|---|---|---|---|
| | | *Catgut.* | |
| 000 | 3.0 | 2.7 | 2.4 |
| 1 | 7.3 | 5.5 | 5.0 |
| 5 | 11.6 | 7.7 | 7.1 |
| 10 | 33.0 | 17.5 | 16.5 |
| | | *Silk.* | |
| 000 | 3.0 | 2.2 | 2.0 |
| 1 | 4.9 | 3.5 | 3.4 |
| 5 | 10.4 | 9.4 | 9.3 |
| 10 | 18.7 | 17.1 | 17.0 |

Thus a No. 10 catgut suture breaks under a strain of 33 kilogrammes when simply stretched, whereas the presence of a surgeon's knot causes it to break under a strain of 17.5 kilogrammes. But in the case of silk the presence of a knot only produces a relatively slight weakness in the threads.—*British Dental Journal.*